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NATIONAL DAM SAFETY PROGRAM. LAKE TRANQUILITY DAM (NJ00275), DE--ETC(U)
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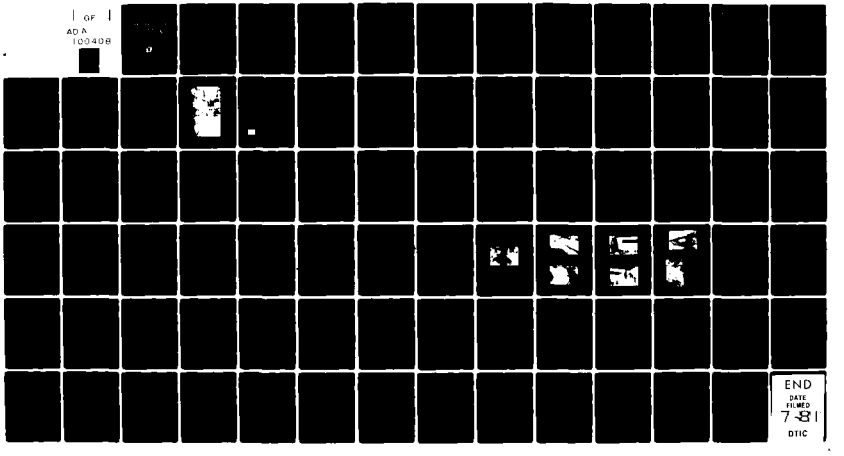

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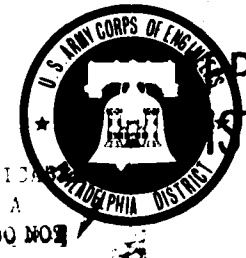
DELAWARE RIVER BASIN
TRIBUTARY TO PEQUEST RIVER
SUSSEX COUNTY
NEW JERSEY

LEVEL II

LAKE TRANQUILITY DAM
NJ 00275

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



DEPARTMENT OF THE ARMY
Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

REPT NO: DACW61/NAP-53842/NJ00275-81/03

MARCH 1981

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REPORT DOCUMENTATION PAGE

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1. REPORT NUMBER: DAEN/NAP-53842/NJ00275-81/03	2. GOVT ACCESSION NO.: AD-A102 408
3. RECIPIENT'S CATALOG NUMBER:	
4. TITLE (and Subtitle): Phase I Inspection Report National Dam Safety Program Lake Tranquility, NJ00275 Sussex County, NJ	5. TYPE OF REPORT & PERIOD COVERED: FINAL 6. PERFORMING ORG. REPORT NUMBER:
7. AUTHOR(s): Yu, Peter P.E.	8. CONTRACT OR GRANT NUMBER(s): DACW61-79-C-0011
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Langan Engineering Associ. Inc. 990 Clifton Ave. Clifton, N.J. 07013	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS:
11. CONTROLLING OFFICE NAME AND ADDRESS: NJ Department of Environmental Protection Division of Water Resources P.O. Box CN029 Trenton, NJ 08625	12. REPORT DATE: March, 1981 13. NUMBER OF PAGES: 42
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office): U.S. Army Engineer District, Philadelphia Custom House, 2d & Chestnut Streets Philadelphia, PA 19106	15. SECURITY CLASS. (of this report): Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE:

16. DISTRIBUTION STATEMENT (of this Report)

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17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Copies are obtainable from National Technical Information Service, Springfield, Virginia 22151.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dams	National Dam Safety Program	Embankments
Embankments	Lake Tranquility Dam, NJ	Seepage
Visual Inspection	Riprap	
Structural Analysis	Spillways	

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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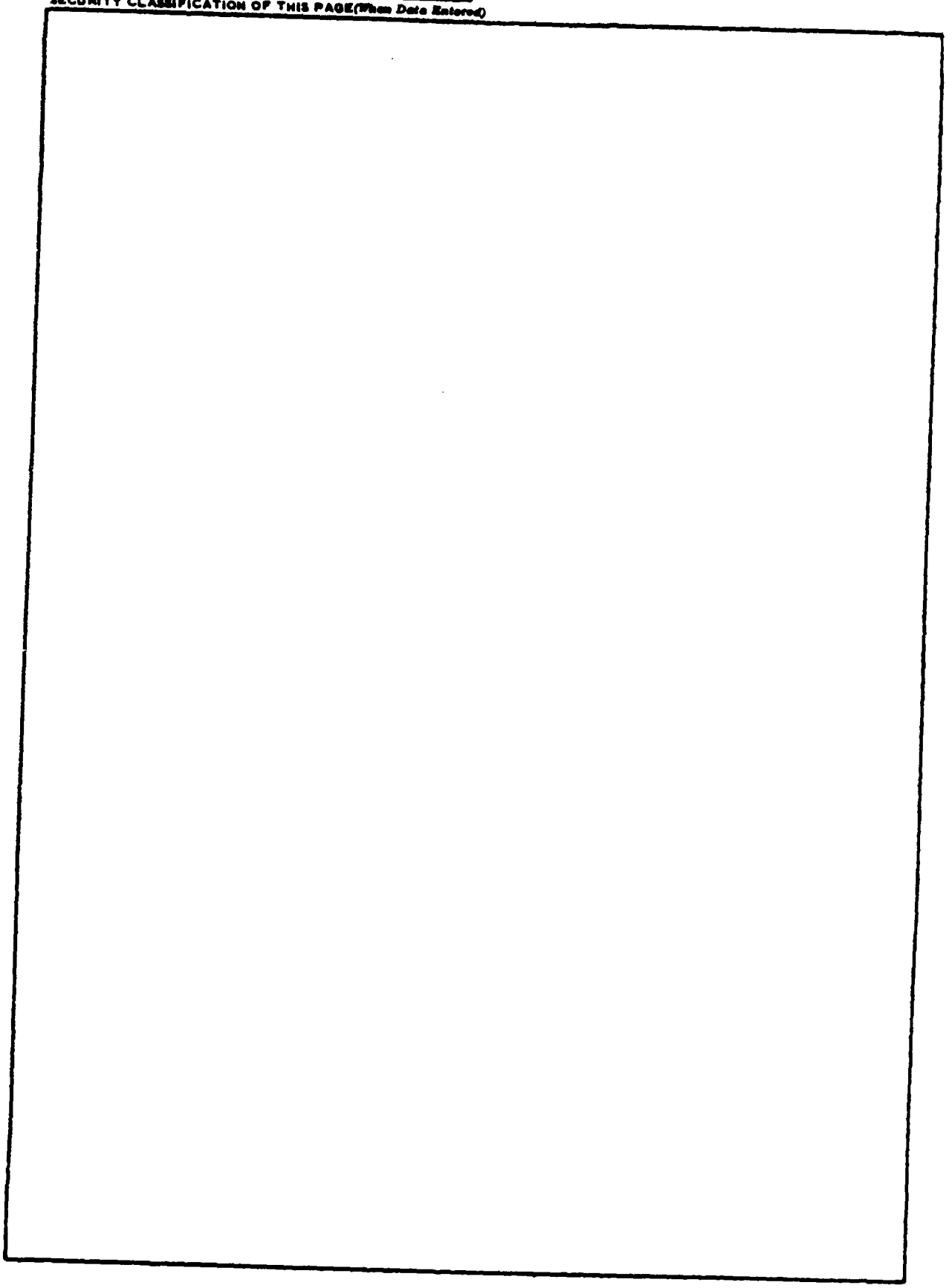
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)



DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE – 2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-N

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED.

6 JUN 1979

Honorable [illegible]
Governor of [illegible]
Trenton, [illegible]

Dear Governor [illegible]:

Inclosed is the [illegible] Inspection [illegible] of Lake Tranquility Dam in Sussex County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law [illegible]. A brief assessment of the dam's condition is given [illegible] of the report.

Based on visual inspection, available records, calculations and past operational performance, Lake Tranquility Dam, a high hazard potential structure, is judged to be in poor overall condition. The spillway is considered seriously inadequate since a flow equivalent to 13 percent of the Probable Maximum Flood (PMF) would cause the dam to be overtopped. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE classification applied for a structural deficiency. It does mean, however, that based on an initial screening and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard [illegible] downstream from the dam. [illegible] adequacy of the [illegible] recommended.

a. [illegible] professional [illegible] methods [illegible] of approval [illegible] remedial [illegible] spillway [illegible] interim [illegible] promptly [illegible] around [illegible]

c. The following remedial measures should be initiated within four months from the date of approval of this report:

(1) Determine ownership of dam.

(2) Repair cracks and deteriorated concrete in the spillway structure.

(3) Repair erosion of embankment caused by outlet pipe discharge.

(4) Repair all eroded areas caused by storm runoff or footpaths on upstream and downstream slopes.

(5) Determine if the waste sluice and sluice gate are in satisfactory working condition and repair if necessary.

b. The following remedial measures should be initiated within six months from the date of approval of this report:

(1) Repair protective riprap on upstream face of dam.

(2) Remove debris and sedimentation from the approach and discharge channels of the spillway.

(3) Perform additional investigation to determine seepage conditions through and under the dam, the engineering properties of the dam and foundations, and whether conventional safety margins exist under more severe stress conditions than those observed during inspection, and what modifications may be required to achieve such safety margins.

d. The following remedial actions should be initiated within twelve months from the date of approval of this report:

(1) Investigate the structural condition and the maximum safe load capacities of the bridge and its supporting abutments.

(2) Properly remove all trees and provide adequate filter coverage on the downstream face of the embankment to prevent any piping which may occur as a result of future root decay.

(3) Develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Courter of the Thirteenth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

NAPEN-N
Honorable Brendan T. Byrne

Additional copies of this report may be obtained from the National Technical Information Services ("TIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Inspection Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,

KENNETH K. MOSER
Major, Corps of Engineers
Acting Commander and District Engineer

1 Incl
As stated

Copies furnished:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

[illegible]

CORPS OF ENGINEERS ACTION [illegible] GENERAL CONDITIONS

This dam was inspected on 27 August, [illegible] October and it [illegible] Engineering Associates, Inc., under contract to the State [illegible] State, under agreement with the U.S. Army Engineer District, Philadelphia, for this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Lake Tranquility Dam, a high hazard potential [illegible], is judged to be in poor overall condition. The spillway is considered seriously inadequate since a flow equivalent to 15 percent of the Probable Maximum Flood (PMF) would cause the dam to be overtopped. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until such [illegible] prove otherwise or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard of loss of life downstream from the dam. To ensure adequacy of the structure, the following actions, as a minimum, are recommended.

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures and studies within three months from the date of approval of this report. Within three months of the consultant's findings remedial measures to ensure spillway adequacy should be initiated. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, during periods of unusually heavy precipitation around the clock surveillance should be provided.

b. The following remedial measures should be initiated within three months from the date of approval of this report:

(1) Determine ownership of dam.

(2) Repair cracks and deteriorated concrete in the spillway structure.

(3) Repair erosion of embankment caused by catch basin discharge.

(4) Repair all eroded areas caused by storm runoff or footpaths on upstream and downstream slopes.

(5) Determine if the waste sluice and sluice gate are in satisfactory working condition and repair if necessary.

c. The following remedial measures should be initiated within six months from the date of approval of this report:

(1) Repair protective riprap on upstream face of dam.

(2) Remove debris and sedimentation from the approach and discharge channels of the spillway.

(3) Perform additional investigation to determine seepage conditions through and under the dam, the engineering properties of the dam and foundations, and whether conventional safety margins exist under more severe stress conditions than those observed during inspection, and what modifications may be required to achieve such safety margins.

d. The following remedial actions should be initiated within twelve months from the date of approval of this report:

(1) Investigate the structural condition and the maximum safe load capacities of the bridge and its supporting abutments.

(2) Properly remove all trees and provide adequate filter coverage on the downstream face of the embankment to prevent any piping which may occur as a result of future root decay.

(3) Develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

APPROVED: Kenneth R Moser

KENNETH R. MOSER
Major, Corps of Engineers
Acting Commander and District Engineer

DATE: 5 June 1981

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-N

29 MAY 1981

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, NJ 08625

Dear Governor Byrne:

This is in reference to our ongoing National Program for Inspection of Non-Federal Dams within the State of New Jersey. Lake Tranquility Dam (Federal I.D. No. NJ00275), a high hazard potential structure, has recently been inspected. The dam is owned by the Lake Tranquility Community Club, and is located on a tributary of the Pequest River in Green Township, Sussex County.

Using Corps of Engineers screening criteria, it has been determined that the dam's spillway is seriously inadequate because a flow equivalent to 13 percent of the Probable Maximum Flood would cause the dam to be overtopped. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise, or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE classification applied for a structural deficiency. It does mean, however, that based on an initial screening and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard potential to loss of life downstream from the dam. As a result of this UNSAFE determination, it is recommended that the dam's owners take the following measures within 30 days of the date of this letter:

a. Engage the services of a qualified professional consultant to more accurately determine the spillway adequacy by using more detailed and sophisticated hydrologic and hydraulic analyses, and to recommend any remedial measures required to prevent overtopping of the dam.

NAPEN-R
Honorable Brendan T. Byrne

3. In the interim, a detailed emergency operation plan and downstream warning system should be promptly developed. Also, around the clock surveillance should be provided during periods of unusually heavy precipitation.

A final report on this Phase I inspection will be forwarded to you within two months.

Sincerely,

KENNETH K. MOSER
Major, Corps of Engineers
Acting District Engineer

Copies Furnished:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

[illegible]

NATIONAL PROGRAM OF INSPECTION OF DAMS

[illegible] NAME: Lake Tranquility Dam

[illegible] ID NO.: NJ0027[illegible]

[illegible] LOCATION State: New Jersey, County: Sussex.

River or Stream: Tributary of Pequest River

Nearest [illegible] City or Town: Green Township

[illegible] HEIGHT: 14 feet

[illegible] MAXIMUM IMPOUNDMENT CAPACITY: 676 ac. ft.

[illegible] TYPE: [illegible]

[illegible] OWNER: Lake Tranquility Community Club

[illegible] DATE [illegible] NOTIFIED OF UNSAFE CONDITIONS: 29 May 1981

[illegible] [illegible] High Hazard, UNSAFE, Non-Emergency.

. EMERGENCY ACTIONS TAKEN:
[illegible] notified [illegible] this condition by District Engineer's letter of 29 May 1981.

[illegible] REMEDIAL ACTIONS TAKEN:
N.J.D.E.P. will notify dam's owner upon receipt of our letter.

. REMARKS: Final report, to be issued within [illegible] weeks, will note which cover.

1. CONDITION OF DAM RESULTING IN UNSAFE ASSESSMENT:
Preliminary report calculations indicate 1[illegible]% of the PMF would overtop the dam.

3. DESCRIPTION OF DANGER INVOLVED: High hazard potential, overtopping and failure of the dam would significantly increase hazard potential to loss of life and property downstream of dam.

[illegible] RECOMMENDATIONS GIVEN TO GOVERNOR:
Within 30 days of the date of the District Engineer's letter the owner should do the following:

a. Engage the services of a qualified professional consultant to more accurately determine the spillway adequacy by using more detailed and sophisticated hydrologic and hydraulic analyses, and to recommend any remedial measures required to prevent overtopping of the dam.

b. In the interim, a detailed emergency operation plan and downstream warning system should be developed. Also, around the clock surveillance should be provided during periods of unusually heavy precipitation.

T.B. Heverin

T.B. HEVERIN, Coordinator
Dam Inspection Program
[illegible].A.[illegible]., Philadelphia

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

NAME OF DAM:	LAKE TRANQUILITY DAM
ID NUMBER:	FED ID No NJ 00275
STATE LOCATED:	NEW JERSEY
COUNTY LOCATED:	SUSSEX
STREAM:	TROUT BROOK, TRIBUTARY TO PEQUEST RIVER
RIVER BASIN:	DELAWARE
DATE OF INSPECTION:	AUGUST, SEPTEMBER & DECEMBER 1980

ASSESSMENT OF GENERAL CONDITIONS

Lake Tranquility Dam, classified as having high hazard potential, is 41 years old and is in poor overall condition. The embankment slopes are overgrown with trees and brush and are eroded by catch basin discharge and footpaths. There is seepage at the downstream toe. The upstream riprap is deteriorated. The concrete work of the spillway structure is extensively cracked and deteriorated. The operating condition of the waste sluice gate is unknown. Debris has accumulated in the upstream and downstream channels. Ownership of the dam has not been established. There is no available information concerning the engineering properties of materials used in the dam construction; very little information concerning construction methods and no operational records have been found. Additional investigation is necessary to adequately evaluate the future performance of the dam.

The spillway capacity as determined by the Corps of Engineers Screening Criteria is "seriously inadequate". The dam can adequately pass only 12% of the PMF. The spillway adequacy should be determined using more precise and sophisticated methods and procedures.

The following are recommended to be done very soon:

Determine the ownership of the dam. Repair cracks and deteriorated concrete in the spillway structure. Repair erosion of embankment caused by catch basin discharge. Repair all eroded areas caused by storm runoff or footpaths on upstream and downstream slopes. Determine if the waste sluice and sluice gate are in satisfactory working condition and repair if necessary. The spillway of the dam is "serously inadequate" as defined in the Corps of Engineers ETL 1110-2--234. The need for and type of mitigating measures should be determined, around the clock surveillance during periods of unusually heavy precipitation provided, and a warning system established.

The following are recommended to be done soon:

Repair protective riprap on upstream face of dam. Remove debris and sedimentation from the approach and discharge channels of the spillway. Perform additional investigation to determine seepage conditions through and under the dam, the engineering properties of the dam and foundation, and whether conventional safety margins exist under more severe stress conditions than those observed during our inspection, and what modifications may be required to achieve such safety margins.

The following are recommended to be done in the near future:

Investigate the structural condition and the maximum safe load capacities of the bridge and its supporting abutments. Properly remove all trees and provide adequate filter coverage on the downstream face of the embankment to prevent any piping which may occur as a result of future root decay. Develop written operating procedure, and a periodic maintenance plan to ensure the safety of the dam.

K. Peter Yu, P.E.

OVERALL VIEW

LAKE TRAIL UTILITY DAM

27 August 1980

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

NAME OF DAM:	LAKE TRANQUILITY DAM
ID NUMBER:	FED ID No NJ 00275
STATE LOCATED:	NEW JERSEY
COUNTY LOCATED:	SUSSEX
STREAM:	TROUT BROOK, TRIBUTARY TO PEQUEST RIVER
RIVER BASIN:	DELAWARE
DATE OF INSPECTION:	AUGUST, SEPTEMBER & DECEMBER 1980

LANGAN ENGINEERING ASSOCIATES, INC.

Consulting Civil Engineers
990 CLIFTON AVENUE
CLIFTON, NEW JERSEY
201-472-9366

CONTENTS

NATIONAL DAM SAFETY REPORT

LAKE TRANQUILITY DAM FED ID NO NJ 00275

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

SECTION 1 PROJECT INFORMATION

1.1 General

Authority to perform the Phase I Safety Inspection of Lake Tranquility Dam was received from the State of New Jersey, Department of Environmental Protection, Division of Water Resources by letter dated 12 August 1980. Tnis Authority was given pursuant to the National Dam Inspection Act, Public Law 92-367 and by agreement between the State and the US Army Engineers District, Philadelphia.

The purpose of the Phase I Investigation is to develop an assessment of the general conditions with respect to safety of Lake Tranquility Dam and appurtenances based upon available data and visual inspection, and determine any need for emergency measures and conclude if additional studies, investigations and analyses are necessary and warranted. The assessment is made using screening criteria established in Recommended Guidelines for Safety Inspection of Dams prepared by the Department of Army, Office of the Chief of Engineers. It is not the purpose of the inspection report to imply that a dam meeting or failing to meet the screening criteria is, per se, certainly adequate or inadequate.

1.2 Project Description

a. Description of Dam and Appurtenances

Lake Tranquility Dam is a 170 ft long, 14 ft high earth embankment dam constructed in 1939 with approximately 2H:1V upstream and downstream slopes. Plans indicate the dam was constructed with a concrete core wall and sheet pile cutoff. There is an asphalt paved road (Scenic Drive) along the crest of the dam. The road bridges over a 30 ft long, 3 ft wide concrete broad crested weir spillway near the center of the dam. The upstream approach channel has the same width as the spillway weir and is formed by two concrete wing walls approximately 7 feet long with a stone paved bottom extending approximately 14 feet perpendicularly upstream of the weir. The downstream channel of the spillway is formed by two concrete wing walls extending approximately 30 ft perpendicularly downstream of the weir. A concrete scour pad exists immediately downstream of the spillway and extends to the end of the wing walls.

There is a 2 ft by 2 ft wide waste sluice with a sluice gate formed in the south wing wall. The access to the gate control is located on the upstream side adjacent to Scenic Road. Its outlet is located approximately 8 ft on the north face of the downstream south wing wall. The discharge invert of the waste sluice is at the same level as the top of the scour pad. The operating condition of the sluice gate is not known.

b. Location

The dam is located on Scenic Drive at the southwest end of Lake Tranquility in the Township of Green, Sussex County, New Jersey. It is at north latitude 40° 56.9' and west longitude 74° 47.2'. A regional vicinity map is given in Fig 1.

c. Size Classification

Lake Tranquility Dam is classified as being "Small" on the basis of its maximum reservoir storage volume of 676 acre feet, which is more than 50 acre feet but less than 1,000 acre feet. It is also classified as "Small" on the basis of its height of 14 feet, which is less than 40 feet.

d. Hazard Classification

On the National Inventory of Dams, Lake Tranquility Dam is classified as having "High Hazard Potential". Visual inspection shows there is a school and about 20 other permanent structures within 1500 feet downstream of the dam. Although the school and most of the associated structures are generally at relatively high elevations, a 1-story 3-apartment building is located at an elevation only slightly above the stream channel. Therefore, it is proposed to keep the Hazard Classification Potential as "High".

e. Ownership

Ownership of the dam appears to be the Lake Tranquility Community Club. Conversations with a representative of the organization, Mr. M. Spino of 17 Sunset Drive, Andover, N. J. 07821, revealed that the community club owns the lake, but they are not positive they own the dam. No other owner was reported by the Township of Green Tax Assessor or the State of New Jersey Division of Taxation. Therefore, ownership of the dam has not been established.

f. Purpose of Dam

The purpose of the dam is "landscaping scenery" as described on The State of New Jersey Water Policy Commission, Application for Permit for Construction or Repair of Dam, Dam Application No 336, May 1, 1939 and is "Private Pleasure Pond" as described on the Report on Dam Application, May 29, 1939.

g. Design and Construction History

Design of Lake Tranquility Dam was by Mr. Cornelius C. Vermeule, 38 Park Row, New York City, New York, License No 926. Plans were issued by Mr. Vermeule in April 1939 and permit for construction issued by the State of New Jersey State Water Policy Commission on June 7, 1939. Construction of Lake Tranquility Dam was begun on July 27, 1939 and was completed by November 3, 1939. Mr. Vermeule was the Engineer in Charge. Work was done by the Alexander Milne Company, 20 Race Street, North Plainfield, New Jersey. The dam was inspected and accepted by the New Jersey State Water Policy Commisssion in a letter by Mr. H. T. Critchlow, Engineer in Charge, November 30, 1939.

h. Normal Operational Procedures

No formal operational procedures have been found.

1.3 Pertinent Data

a.	Drainage Areas	3.03 sq. mi.
b.	Discharge at Dam site	
	Maximum known flood at dam site	unknown
	Ungated spillway capacity at max. pool elev.	767 cfs
	Total spillway capacity at max. pool elev.	767 cfs
c.	Elevation (Datum unknown)	
	Top Dam	El 102.0
	Maximum pool-design surcharge	El 102.0 (Assumes top of dam)
	Recreation pool	El 98.5 (Assumes spillway crest)
	Spillway crest	El 98.5
	Streambed at centerline of dam	El 88.0
	Maximum tailwater	unknown
d.	Reservoir	
	Length of maximum pool	approx 4,500 ft
	Length of recreation pool	approx 4,250 ft
e.	Storage (acre-feet)	
	Recreation pool	495 ac ft
	Design surcharge	unknown
	Top of dam	676 ac ft
f.	Reservoir Surface (acres	
	Top dam	53 Ac
	Maximum pool	53 Ac (Assumes top of dam)
	Recreation pool	50.6 Ac (Assumes spillway crest)
	Spillway crest	50.6 Ac

g.	Dam	
	Type	Earth embankment concrete core wall, sheet pile cut off
	Length	170 ft
	Height	14 ft
	Top Width	12 ft
	Side Slopes	Approx 2H:1V upstream & downstream
	Zoning	Unknown
	Impervious Core	Concrete core wall
	Cutoff	Steel sheet piling
h.	Spillway	
	Type	Ungated concrete broad crested weir
	Length of weir	30 ft
	Crest elevation	98.5 (datum unknown)
	Gates	None
	U/S Channel	7 ft wing walls N&S sides perpendicular to crest, stone block approach pad
	D/S Channel	30 ft wing walls N&S sides perpendicular to crest, with concrete scour pad
i.	Regulating Outlets	2 ft x 2 ft steel sluice gate in retangular sluice with controlling dimensions of 2 ft x 2 ft through south wing wall. Intake below water surface at upstream embankment toe, discharge perpendicular to south wing wall at el 88 (datum unknown) 8 ft downstream of toe of spillway.

NOTE: Elevations were taken from original drawings of the dam.

SECTION 2 ENGINEERING DATA

2.1 Design

Lake Tranquility Dam was designed in 1939 by Cornelius C. Vermeule, 38 Park Row, New York, New York. The available design information that is on file with the New Jersey Department of Environmental Protection, Dam Application No. 336 is listed in the enclosed Engineering Check List.

2.2 Construction

The dam was constructed in July through November of 1939 by the Alexander Milne Company, 20 Race Street, North Plainfield, New Jersey. Monthly construction progress reports submitted by Cornelius C. Vermuel, Engineer-in-charge of Construction, are on file with the New Jersey Department of Environmental Protection, Dam Application No. 336.

2.3 Operation

No information concerning operational procedures for the dam have been found.

2.4 Evaluation

a. Some information concerning the original geometry of the dam is on file with the New Jersey Department of Environmental Protection, Dam Application No. 336. Our visual inspection shows modifications have been made to the original dam. Records of these modifications have not been found.

b. Available information is not adequate for an engineering analysis of the dam.

c. The validity of the available information concerning the design of the dam cannot be determined.

SECTION 3 VISUAL INSPECTION

Visual inspection of the dam showed the embankments to be in generally poor condition. The upstream riprap has deteriorated and eroded. There has been erosion of the south downstream embankment, which has occurred as a result of discharge from the roadway catch basin. Clear water was observed seeping at the toe of the south embankment where it meets the south spillway wing wall. Both the north and south embankments are overgrown with trees and brush.

A 1 1/2 ft high by 1 ft wide concrete weir has been constructed along the entire length of the original spillway weir. All concrete associated with the spillway structure has extensive spalling and numerous cracks. The approach channel of the spillway has approximately 6 inches of silt deposition bearing occasional pieces of broken limbs. The downstream channel has pieces of stone, dead branches, tires and other debris in it. Soil and gravel have been deposited

in the downstream channel in large enough quantities to support the growth of vegetation.

The sluice gate is not observable and its conditons are unknown.

SECTION 4 OPERATIONAL PROCEDURES

No procedures for operation of the Lake Tranquility Dam have been found. Maintenance of the dam and sluice gate appears to be by the Lake Tranquility Community club. No warning system was in effect.

SECTION 5 HYDRAULIC/HYDROLOGIC

Conversations with local residents and town officials indicate that no recent overtopping has occurred.

The hydraulic/hydrologic evaluation is based on a Spillway Design Flood (SDF) equal to the Probable Maximum Flood chosen in accordance with the evaluation guidelines for dams classified as high hazard and small in size. Hydrologic design data for this dam was available. It was not apparent whether these calculations were done before or after the addition of the 1 1/2' x 1' concrete crest. The available data was not legible to a certain extent. The PMF has been determined by developing a synthetic hydrograph based on the probable maximum precipitation of 22.0 inches (200 sq. mi - 24 hour). The Corps of Engineers has recommended the use of the SCS triangular unit hydrograph with the curvilinear transformation. Hydrologic computations are presented in Appendix 3. The PMF peak inflow determined for the subject watershed is 9109 cfs.

The capacity of the spillway at maximum pool elevation 102 is 767 cfs which is significantly less than the SDF discharge. Routing for the 1/2 PMF and PMF indicate the dam will overtop by 3.73 ft and 6.52 ft respectively. The dam can adequately pass ony 12% of the PMF.

The downstream potential damage center within the Township of Green is located along the Trout Brook and extends 500-1500 feet from the dam. The existing school and most of the associated structures are generally at relatively high elevations, however, a 1-story 3-apartment building is located at an elevation only slightly above the stream channel. Preliminary analysis indicates a significant rise of water level at the location of the potential damage center will occur immediately after dam breach. In addtion, Scenic Drive exists along the crest of the dam. Based on these reasons, it is our opinion that dam failure from overtopping would significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure. Therefore, the spillway capacity of Lake Tranquility Dam is considered to be "seriously inadequate" as defined in the Corps of Engineers ETL 1110-2-234.

The present drawdown structure consists of a 2' x 2' square concrete sluice in the south spillway abutment (see Fig. 2c) with an invert elevation of 88.0. Its operating condition is unknown. Drawdown of the reservoir has been evaluated assuming that the drawdown structure is operable. Our calculations indicate that the lake level could be lowered 6 1/2 ft in approximately 3 days.

SECTION 6 STRUCTURAL STABILITY

Visual observations of Lake Tranquility Dam revealed that the concrete spillway structure, wing walls, and bridge have numerous large cracks to approximately 1/4" wide traversing many feet and areas of extensive spalling and deterioration. Water can be seen seeping through cracks in the downstream face of the spillway weir. The earth embankment of the dam is overgrown with trees and brush. Erosion of the south embankment has occurred due to the discharge of a roadway catch basin. There is seepage at the downstream toe of the south embankment next to the wing wall. The upstream riprap has deteriorated and eroded. These deficiencies are considered detrimental to the stability of the dam.

No operating records are available for Lake Tranquility Dam.

A concrete weir, 1.5 ft high, 1.0 ft wide, across the entire length of the spillway was added on top of the original weir.

Lake Tranquility Dam is located in Seismic Zone 1 of the Seismic Zone Map of Contiguous States. As no information is available concerning the engineering properties of materials used in the dam construction, the static and seismic stability of the dam cannot be adequately evaluated without additional information or further investigation.

SECTION 7 ASSESSMENT, RECOMMENDATION/REMEDIAL MEASURES

7.1 Dam Assessment

Lake Tranquility Dam is 41 years old and is in poor overall condition. The embankment slopes are overgrown with trees and brush and are eroded by street catch basin discharge and foot paths. There is seepage at the toe of the south embankment. The upstream riprap is deteriorated. The concrete works of the spillway is extensively cracked and deteriorated. The operating condition of the sluice gate is unknown. Debris has accumulated in the upstream and downstream channels. Ownership of the dam has not been established.

There is no available information concerning the engineering properties of materials used in the dam construction; very little information concerning construction methods and no operational records have been found. Additional investigation is necessary to adequately evaluate the future performance of the dam.

The spillway capacity as determined by the Corps of Engineers Screening Criteria is "seriously inadequate". The spillway can pass only 12% of the PMF. The spillway adequacy should be determined using more precise and sophisticated methods and procedures.

7.2 Recommendations/Remedial Measures

The following are recommended to be done very soon:

1. Determine ownership of dam.
2. Repair cracks and deteriorated concrete in the spillway structure.
3. Repair erosion of embankment caused by catch basin discharge.
4. Repair all eroded areas caused by storm runoff or footpaths on upstream and downstream slopes.
5. Determine if the waste sluice and sluice gate are in satisfactory working condition and repair if necessary.
6. The spillway of the dam is "seriously inadequate" as defined in the Corps of Engineers ETL 1110-2-234. The need for and type of mitigating measures should be determined, around-the-clock surveillance during periods of unusally heavy precepitation provided, and a warning system established.

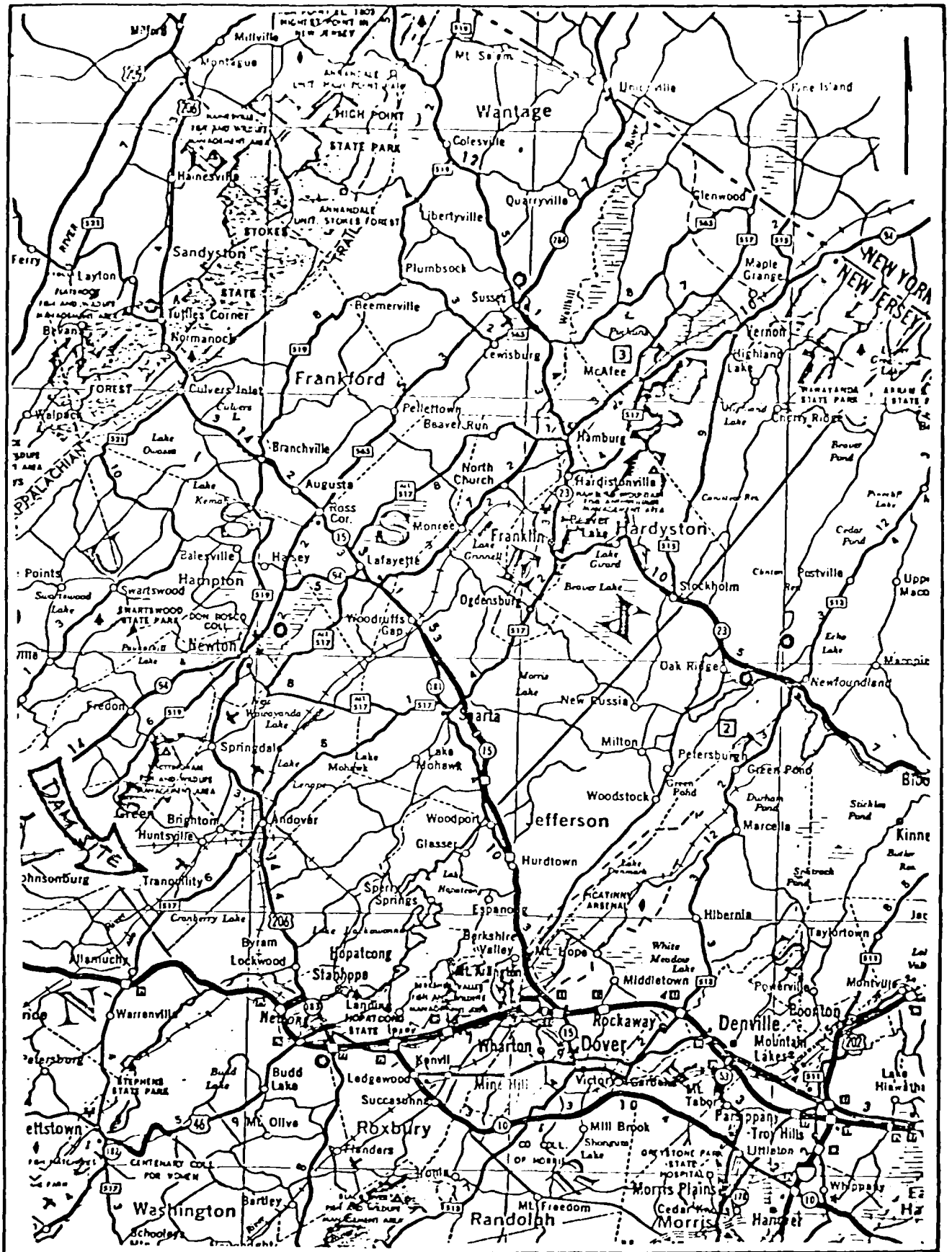
The following are recommended to be done soon:

1. Repair protective riprap on upstream face of dam.
2. Remove debris and sedimentation from the approach and discharge channels of the spillway.
3. Perform additional investigation to determine seepage conditions through and under the dam, the engineering properties of the dam and foundations, and whether conventional safety margins exist under more severe stress conditions than those observed during inspection, and what modifications may be required to achieve such safety margins.

The following are recommended to be done in the near future:

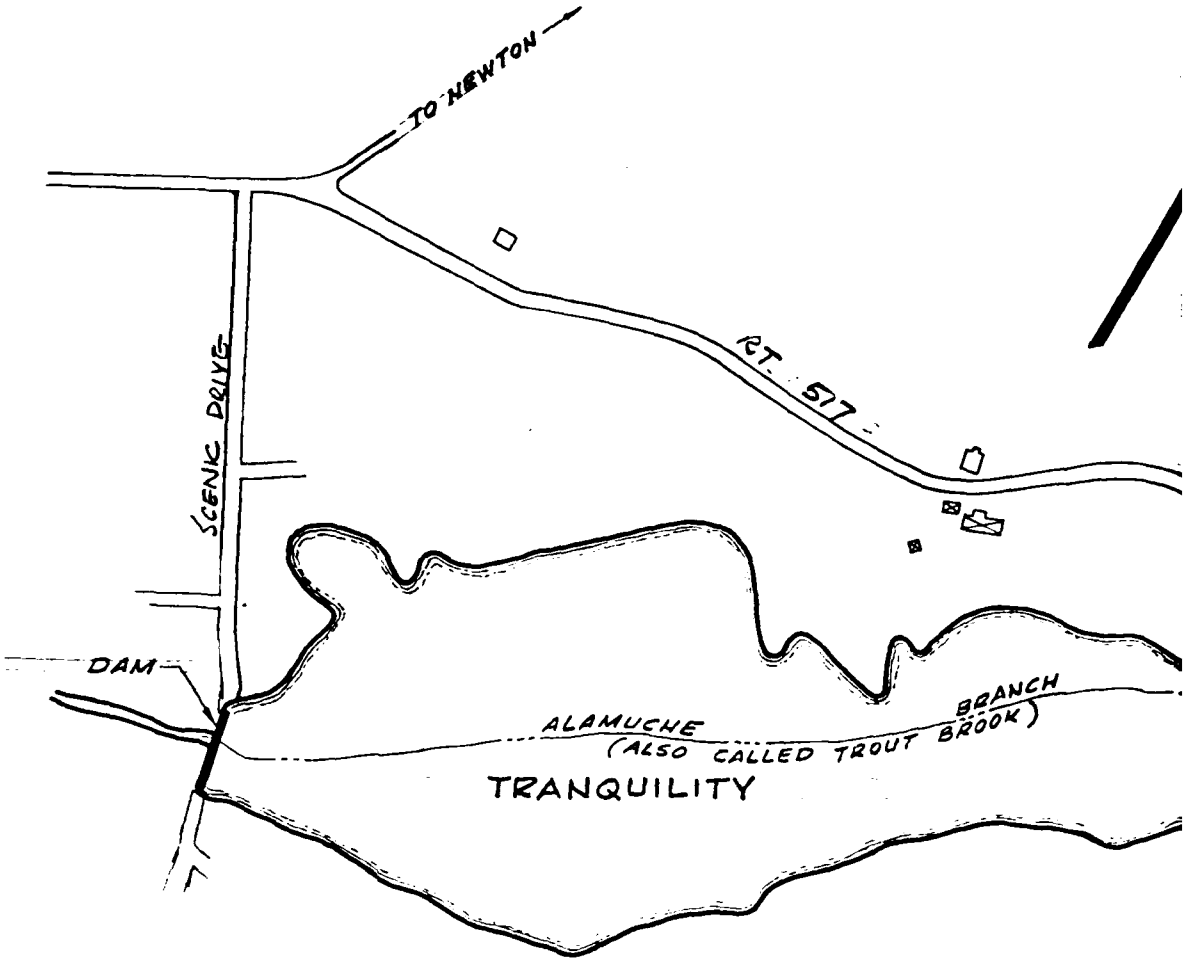
1. Investigate the structural condition and the maximum safe load capacities of the bridge and its supporting abutments.
2. Properly remove all trees and provide adequate filter coverage on the downstream face of the embankment to prevent any piping which may occur as a result of future root decay.
3. Develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

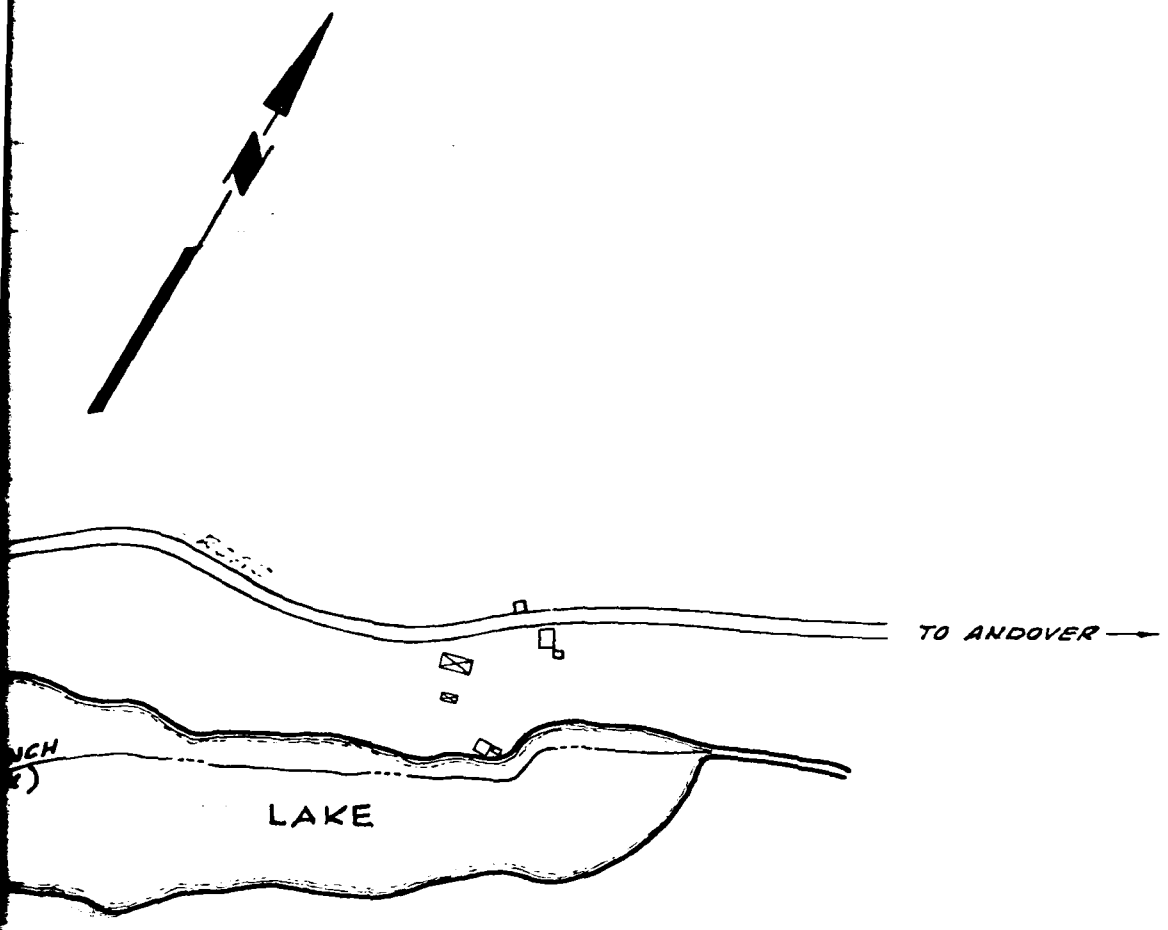
FIGURES



BY _____	DATE _____	REGIONAL VICINITY MAP	JOB NO. 80145
CKD _____	DATE _____	TRANQUILITY LAKE	SHEET NO. _____ OF _____
			SCALE : 1 in ± 2 miles

FIG. 1


TO NEWTON
RT. 517
SCENIC DRIVE
DAM
ALAMUCHE BRANCH
(ALSO CALLED TROUT BROOK)
TRANQUILITY



NOTES:

1. SKETCHES ADAPTED FROM ORIGINAL "PLANS FOR THE PROPOSED TRANQUILITY LAKE DAM" SHEETS 1 THRU 3 BY CORNELIUS C. VERMBULE AND DATED APRIL, 1939.

DAM SITE AND LAKE AREA

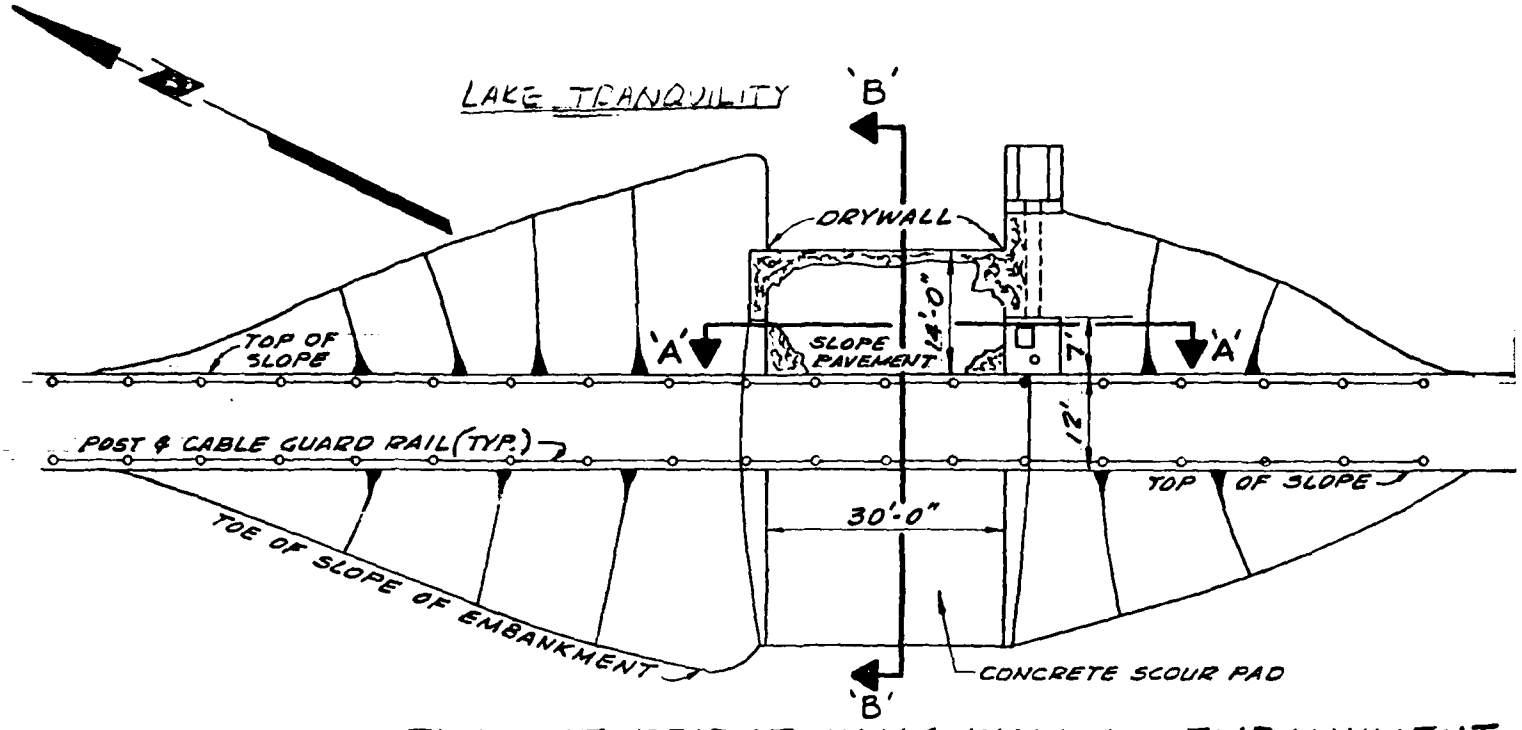
TRANQUILITY LAKE DAM (00275)

GREEN TOWNSHIP SUSSEX COUNTY, N.J.

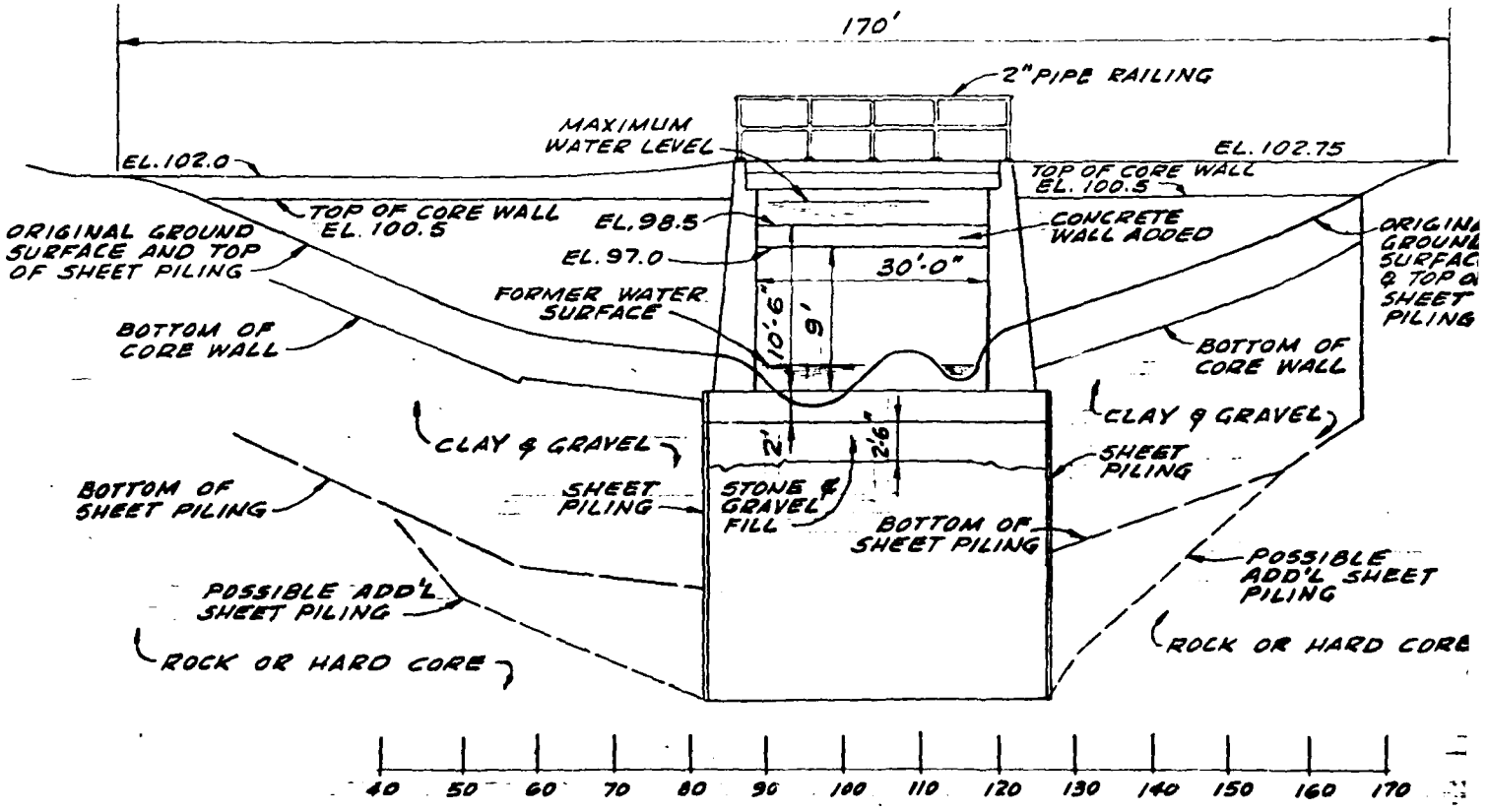
LANGAN ENGINEERING ASSOCIATES, INC.

990 CLIFTON AVENUE CLIFTON, N.J. 07013

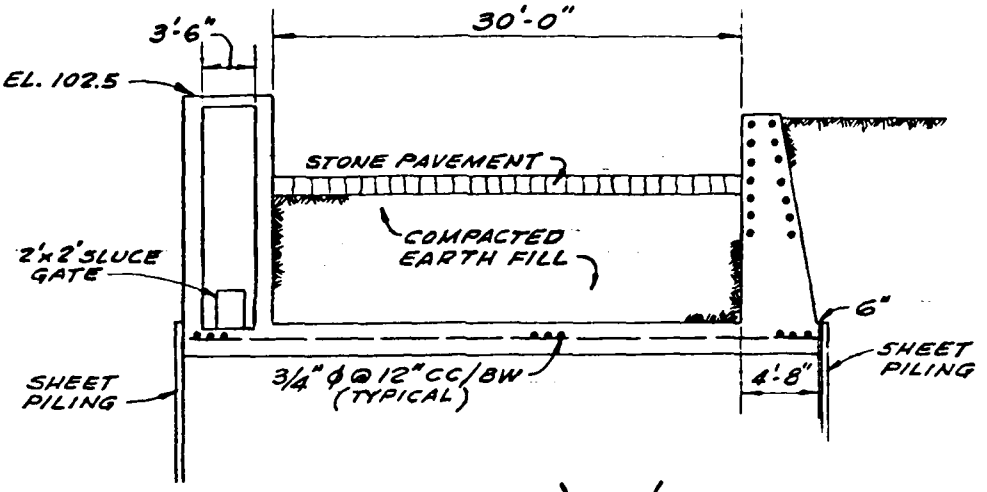
DRN. BY: R.D.	SCALE: N.T.S.	JOB No. 80145
CK'D. BY: V.U.	DATE: 9-10-80	FIG. No. 2A



PLAN OF BRIDGE WING WALLS & EMBANKMENT



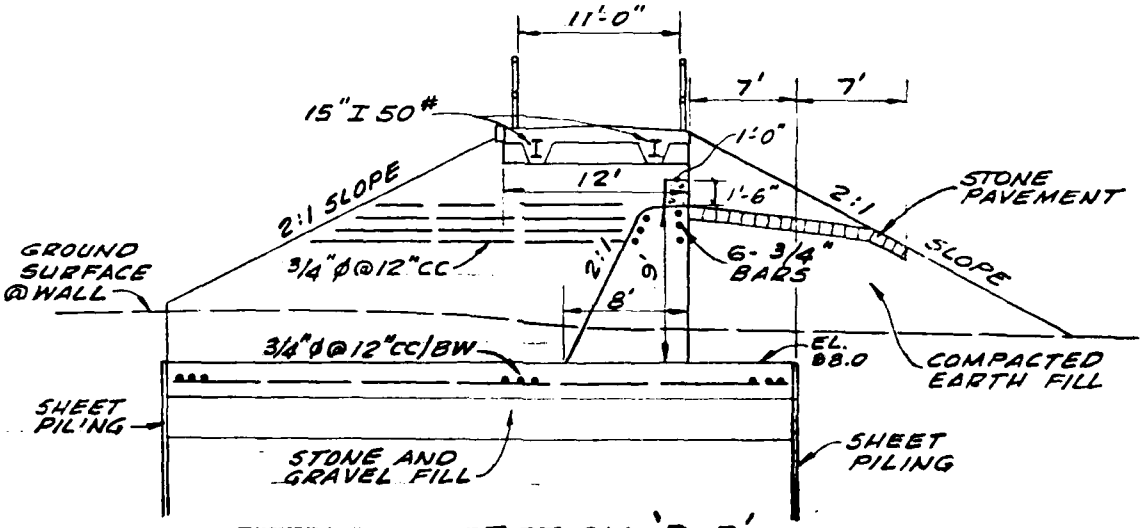
PROFILE ON ℄ OF CORE WALL WITH ELEVATIONS OF



SECTION 'A-A'

(SHOWING FILL & STONE PAVEMENT ABOVE SPILLWAY)

KMENT



SECTION 'B-B'

(THRU SPILLWAY & ELEV. OF NORTH WALL)

75

ORIGINAL GROUND SURFACE @ TOP OF SHEET PILING

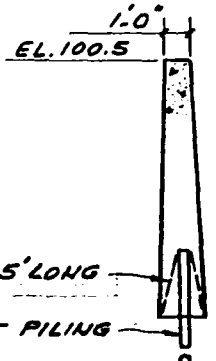
105
100
95
90
85
80
75
70

OF ALL

IBLE SHEET G

HARD CORE)

170



S OF BRIDGE

X-SECTION CORE WALL

NOTES:

1. SKETCHES ADOPED FROM ORIGINAL "PLANS FOR THE PROPOSED TRANQUILITY LAKE DAM", SHEETS 1 THRU 3 BY CORNELIUS C. VERMEULE AND DATED APRIL, 1939.
2. REFERENCE DATUM IS ARBITRARY - NOT ADJUSTED TO M.S.L.

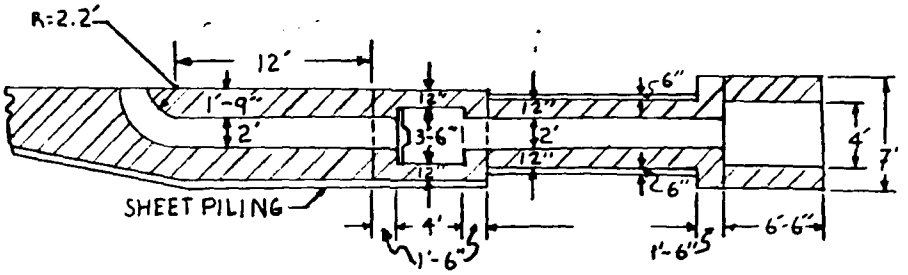
PLAN, SECTIONS & ELEVATIONS
TRANQUILITY LAKE DAM
(00275)

GREEN TOWNSHIP SUSSEX COUNTY, N.J.

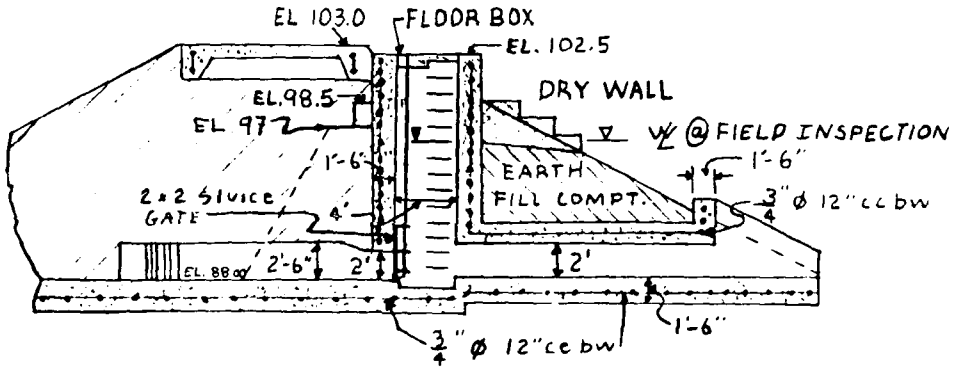
LANGAN ENGINEERING ASSOCIATES, INC.

990 CLIFTON AVENUE CLIFTON, N.J. 07013

DRN. BY:	R.D.	SCALE:	NTS	JOB No.	80145
CK'D. BY:	V.U.	DATE:	9-10-80	FIG. No.	2B



HORIZONTAL SECTION ℄ OF WASTE SLUICE



LONGITUDINAL SECTION THROUGH SOUTH WALL
AND
WASTE SLUICE

NOTES

1) SKETCHES ADOPTED FROM ORIGINAL "PLANS FOR THE PROPOSED TRAQUILITY LAKE DAM," SHEETS 1 THRU 3 BY CORNELIUS C. VERMEULE AND DATED APRIL, 1939

2) REFERENCE DATUM IS ARBITRARY AND NOT ADJUSTED TO M.S.L.

TRANQUILITY LAKE DAM (00275) SLUICE DETAILS GREEN TOWNSHIP, SUSSEX NEW JERSEY		
LANGAN ENGINEERING ASSOCIATES, INC. 990 CLIFTON AVENUE CLIFTON, N.J. 07013		
DRN. BY: Mark Todd	SCALE: NTS	JOB No. 80145
CK'D. BY:	DATE: 9-4-80	FIG. No. 2C

APPENDIX 1

ENGINEERING DATA

LAKE TRANQUILITY DAM

1. HYDROLOGIC AND HYDRAULIC DATA CHECK LIST
2. VISUAL INSPECTION CHECK LIST
3. ENGINEERING DATA CHECK LIST

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 3.03 sq mi (1943 ac)

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): El 98.5, 495 Ac ft

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): Assume top of dam el 102.0, 676 Ac ft

ELEVATION MAXIMUM DESIGN POOL: Assume top of dam - El 102.0

ELEVATION TOP DAM: El 102.0

CREST: Spillway

a. Elevation 98.5
b. Type Broad Crested weir
c. Width 12 inches
d. Length 30 ft
e. Location Spillover Approx center of dam
f. Number and Type of Gates None

OUTLET WORKS:

a. Type 2 ft x 2 ft Minimum opening waste sluice
b. Location South wing wall of spillway
c. Entrance inverts El 88.0
d. Exit inverts El 88.0
e. Emergency draindown facilities Sluice gate

HYDROMETEOROLOGICAL GAGES: None observed

a. Type
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE: El 101 (Bottom of concrete bridge), 392 cfs

NOTE: Elevations taken from original drawings of dam. Reference datum unknown.

Check List
Visual Inspection
Phase I

Name Dam Tranquility Lake Dam County Sussex State New Jersey Coordinators NJ DEP

Date(s) Inspection 27 Aug 1980 Weather Clear Temperature Mid 80's F

Pool Elevation at Time of Inspection El 96.5* Tailwater at Time of Inspection El 88* Not flowing

*Referenced to top of dam at El 102.0

Inspection Personnel:

R. W. Greene 27 Aug 1980

D. J. Leary 17 Sept & 11 Dec 1980

K. P. Yu 11 Dec. 1980

R. W. Greene Recorder

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	NONE VISIBLE - SLOPES COVERED WITH TREES AND BRUSH.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	NONE VISIBLE	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	EROSION OF SOUTH DOWNSTREAM EMBANKMENT CAUSED BY ROADWAY CATCH DISCHARGE.	REPAIR EROSION.
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	NO OBSERVABLE MOVEMENT. CREST USED AS ROADWAY (PAVED)	
RIPRAP FAILURES	UPSTREAM RIPRAP HAS BEEN ERODED.	REPLACE RIPRAP.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
EMBANKMENTS	UPSTREAM & DOWNSTREAM, NORTH AND SOUTH OF SPILLWAY HEAVILY VEGETATED WITH BRUSH & TREES U/S EROSION D/S NORTH SIDE - SOFT GROUND	REMOVE TREES AND BRUSH. PROVIDE ADEQUATE FILTER COVERAGE TO PROTECT ANY PIPING WHICH MAY OCCUR AS A RESULT OF FUTURE ROOT DECAY.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	JUNCTION OF EMBANKMENT & ABUTMENT - NO NOTICEABLE SEEPAGE OR MOVEMENT. JUNCTION OF SPILLWAY & DAM - SLIGHT SEEPAGE OF CLEAR WATER AT SOUTH TOE OF EMBANKMENT AND DOWNSTREAM END OF SOUTH WING WALL.	
ANY NOTICEABLE SEEPAGE	PONDING OF WATER AT DOWNSTREAM FACE OF SPILLWAY. SEEPAGE AT DOWNSTREAM SOUTH WING WALL OF SPILLWAY & TOE OF EMBANKMENT RATE VERY SLOW ~ 1 GPM OF LESS ESTIMATED - NO BOILING OR SOIL MOVEMENT SEEN.	FURTHER INVESTIGATE SEEPAGE CONDITION.
STAFF GAGE AND RECORDER	NONE OBSERVED.	
DRAINS	NONE OBSERVED.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	ORIGINAL 3 FT WIDE SPILLWAY WEIR HAS HAD A 1.5 FT HIGH BY 1 FT WIDE CONCRETE WALL PLACED ACROSS ENTIRE LENGTH OF SPILLWAY. CONCRETE WALL IS TILTED SLIGHTLY DOWNSTREAM. THERE ARE CRACKS IN BOTH THE NEW AND OLD WEIR WITH WATER SEEPING THROUGH THE CRACKS.	REPAIR CRACKS.
APPROACH CHANNEL	APPEARS TO BE APPROX 1/2 FT OF SEDIMENTATION AT MOST. SPALLING AND LARGE CRACKS EXIST IN THE NORTH AND SOUTH APPROACH WING WALLS. SOME BRANCHES & VEGATIVE MATTER HAVE ACCUMULATED IN CHANNEL.	REMOVE SEDIMENTATION AND ACCUMULATED DEBRIS. REPAIR DETERIORATED CONCRETE.
DISCHARGE CHANNEL	SOIL, STONES, & DEBRIS HAVE ACCUMULATED IN THE DISCHARGE CHANNEL. GRASS IS GROWING IN AREAS WHERE SOIL HAS ACCUMULATED.	REMOVE ALL CHANNEL OBSTRUCTIONS.
BRIDGE AND PIERS	ALL CONCRETE ASSOCIATED WITH THE SPILLWAY IS IN A STATE OF GENERAL DETERIORATION WITH EXTENSIVE SPALLING AND LARGE CRACKS.	CONCRETE STRUCTURES SHOULD BE EXAMINED AND REPAIRED AND STRENGTHENED IF REQUIRED.

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	THE SOUTH WING WALL IN WHICH THE WASTE SLUICE IS CAST IS HEAVILY SPALLED WITH NUMEROUS CRACKS.	REPAIR DETERIORATED CONCRETE.
INTAKE STRUCTURE	INTAKE IS ON UPSTREAM SOUTH EMBANKMENT BELOW POOL SURFACE. UNOBSERVABLE.	INVESTIGATE CONDITION OF INTAKE
OUTLET STRUCTURE	THE OUTLET STRUCTURE IS IN THE SOUTH WING WALL. THE WING WALL IS EXTENSIVELY SPALLED AND HAS NUMEROUS CRACKS.	
OUTLET CHANNEL	THE INVERT OF THE DOWNSTREAM OUTLET HAS BEEN PARTIALLY BLOCKED BY GRAVEL AND SILT DEPOSITION.	REMOVE ALL OUTLET OBSTRUCTIONS.
GATE	WASTE SLUICE GATE APPEARS NOT TO HAVE BEEN USED IN RECENT YEARS. CANNOT DETERMINE ITS CONDITION AS IT IS UNDERWATER AND UNOBSERVABLE.	INVESTIGATE OPERATING CONDITIONS OF GATE.

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	GENTLE APPROX. 5H:1V MAX.	
SEDIMENTATION	APPEARS TO BE CONSIDERABLE UPSTREAM OF DAM AND AROUND RESERVOIR BANKS.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	HEAVILY WOODED, WIDE STREAMBED WITH LOW LYING SHOALS - SHOALS TREED & BRUSHY. OCCASIONAL FALLEN BRANCHES IN STREAM.	REMOVE VEGETATION IN STREAM BOTTOM AND ALL CHANNEL OBSTRUCTIONS.
SLOPES	GENTLE APPROX 5 HOR. TO 1 VERT.	
APPROXIMATE NO. OF HOMES AND POPULATION	SCHOOL AND APPROX 20 ASSOCIATED STRUCTURES WITHIN APPROX 1/4 MILE DOWNSTREAM OF DAM. ALL STRUCTURES LOCATED AT RELATIVELY HIGH ELEVATION EXCEPT A 1-STORY 3-APARTMENT BUILDING.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS		
PLAN OF DAM	PLANS FOR THE PROPOSED TRANQUILITY LAKE ON THE PROPERTY OF C. FRANK SCHWEP, ESQ. IN GREEN TOWNSHIP, SUSSEX COUNTY, NEW JERSEY 3 SHEETS	Prepared By: CORNELIUS C. VERMEULE CONSULTING ENGINEER 38 PARK ROW, NEW YORK, NY DATED APRIL 1939	Source: NJ DEP DAM APP No 336
REGIONAL VICINITY MAP	SEE FIGURE 1		
CONSTRUCTION HISTORY	MONTHLY PROGRESS REPORTS TO NJ STATE WATER POLICY COMMISSION BY CORNELIUS C. VERMEULE, ENGINEER IN CHARGE FOR JULY, AUGUST, SEPT., OCT 1939 SOURCE NJ DEP DAM APP NO. 336		
TYPICAL SECTIONS OF DAM	TRANQUILITY LAKE DAM - PROPERTY OF C. FRANK SCHWEP ESQ. IN GREEN TOWNSHIP, SUSSEX CO., N.J. SHEET 2 OF 3	Prepared By: CORNELIUS C. VERMEULE CONSULTING ENGINEER 38 PARK ROW, NEW YORK, NY DATED APRIL 1939	Source: NJ DEP DAM APP NO. 336
HYDROLOGIC/HYDRAULIC DATA	SEE SEC 5 OF REPORT		
OUTLETS - PLAN - DETAILS -CONSTRAINTS -DISCHARGE RATINGS	WASTE SLUICE TRANQUILITY LAKE DAM PROPERTY OF C. FRANK SCHWEP ESQ IN GREEN TOWNSHIP, SUSSEX CO., N.J. SHEET 3 of 3	Prepared By: CORNELIUS C. VERMEULE CONSULTING ENGINEER NEW YORK, N. Y. DATED APRIL 1939	Source: NJ DEP DAM APP NO 336
RAINFALL/RESERVOIR RECORDS	NO INFORMATION FOUND		

ITEM	REMARKS
MONITORING SYSTEMS	NONE OBSERVED
MODIFICATIONS	SPILLWAY CREST RAISED 1.5 FT BY THE INSTALLATION OF CONCRETE WALL 1.5 FT HIGH, 1.0 FT WIDE ALONG ENTIRE LENGTH OF ORIGINAL SPILLWAY CREST. FOUND BY FIELD INSPECTION.
HIGH POOL RECORDS	INFORMATION NOT FOUND
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	NONE FOUND
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	NONE REPORTED
MAINTENANCE OPERATION RECORDS	NONE FOUND

ITEM	REMARKS	
DESIGN REPORTS	INFORMATION NOT FOUND	
GEOLOGY REPORTS	INFORMATION NOT FOUND	
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS *DAM STABILITY* SEEPAGE STUDIES	INFORMATION NOT FOUND	
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	INFORMATION NOT FOUND	
POST-CONSTRUCTION SURVEYS OF DAM	STATE OF NEW JSERSY REPORTS DAM INSPECTION TRANQUILITY LAKE DATED NOV 30, 1939 AND JULY 12, 1940 BY JOHN N. BROOKS ASSISTANT DIVISION ENGINEER	Source NJ DEP DAM APP No. 336
BORROW SOURCES.	INFORMATION NOT FOUND	

ITEM	REMARKS		
SPILLWAY PLAN **SECTIONS** **DETAILS**	PLANS: TRANQUILITY LAK DAM PROPERTY OF C. FRANK SCHWEP ESQ. GREEN TOWNSHIP, SUSSEX CO., NJ SHEETS 2 of 3 and 3 of 3	Prepared By: CORNELIUS C. VERMEULE CONSULTING ENGINEER NEW YORK, NEW YORK DATED APRIL 1939	Source: NJ DEP DAM APP No. 336
OPERATING EQUIPMENT PLANS & DETAILS	WASTE SLUICE GATE PLANS: TRANQUILITY LAKE DAM PROPERTY OF C. FRANK SCHWEP GREEN TOWNSHIP, SUSSEX CO., NJ Sheets 2 of 3 and 3 of 3	Prepared By: CORNELIUS C. VERMEULE CONSULTING ENGINEER NEW YORK, NEW YORK DATES APRIL, 1939	Source: NJ DEP DAM APP No. 336

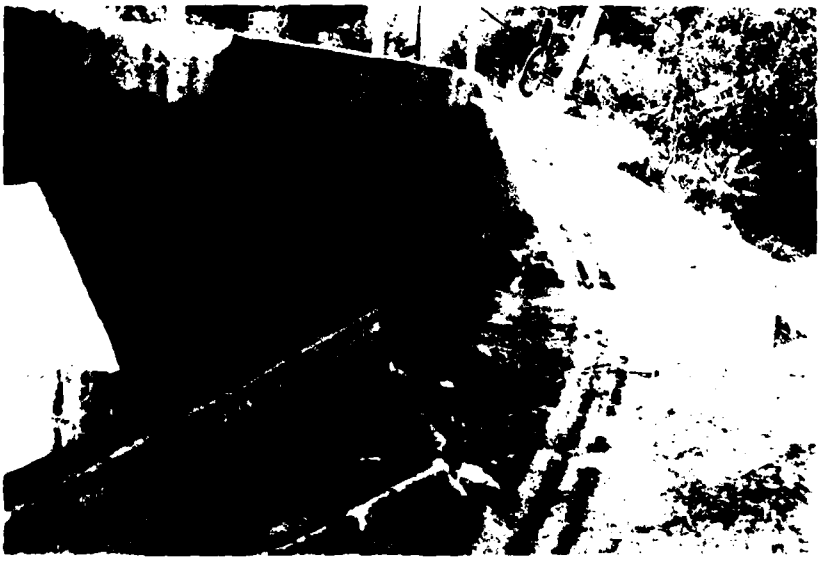
APPENDIX 2

PHOTOGRAPHS

Crest of Dam looking south from north side of dam.

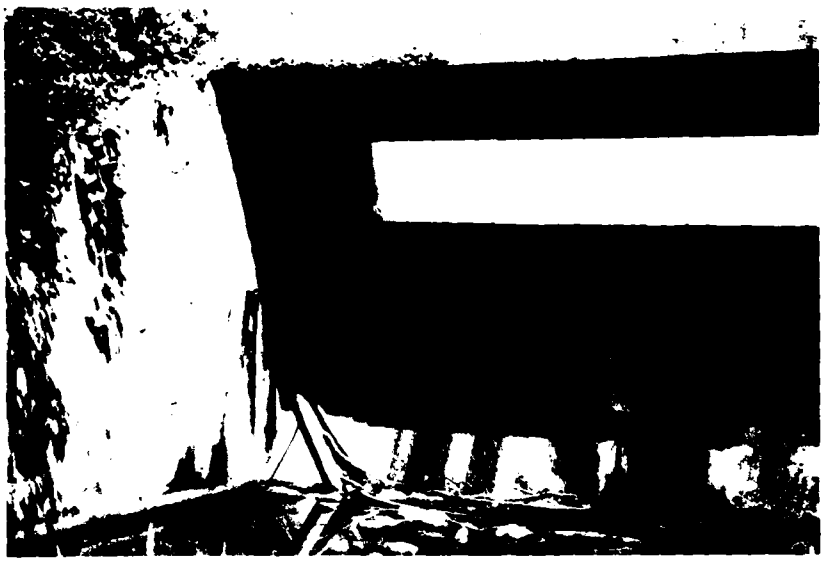
27 August 1980

South spillway wing wall, 27 August 1980
bridge deck and new weir crest.



North spillway wing wall, 27 August 1980
bridge deck and new weir crest.

LAKE TRANQUILITY DAM



North downstream spillway wing wall, bridge deck and weir.

27 August 1980

South downstream spillway wing wall, bridge deck, waste sluice outlet, and weir.

27 August 1980

LAKE TRANQUILITY DAM

View of access opening to sluice gate and control stem of south spillway wing wall.

27 August 1980

Discharge channel looking west from bridge over spillway.

27 August 1980

APPENDIX 3

HYDROLOGIC COMPUTATIONS

LANGAN ENGINEERING ASSOCIATES, INC.

HYDROLOGICAL COMPUTATIONS
TRANQUILITY LAKE DAM

A. Location: Sussex County, NJ, Trout Brook - Pequest River

B. Drainage Area: 3.03 sq. mi (1943 acres)

C. Lake Area: 50.6 ac.

D. Classification: Size - Small
Hazard - high

E. Spillway Design Flood:

F. PMP:

1. Dam located in Zone 6 (near Zone 1 boundary)
PMP = 22.0 inches (for 200 sq. mi, 24 hr, all season envelope*) *

2. PMF must be adjusted by a factor of 0.80** to account for the basin size of less than 10 sq. mi.

% Factor for ≤ 10 sq. mi			
Duration	Zone 1	Zone 6	Avg
0-6	111	113	112
0-12	123	123	123
0-24	133	132	132
0-48	142	142	142

* HMR #33
** Page 48 "Design of Small Dams"

BY VAU DATE 4-19-96 JOB NO. 80245
CKD PJ DATE 7/10/96 Tranquility Lake Dam SHEET NO. 1 OF

LANGAN ENGINEERING ASSOCIATES, INC.

G. UNIT Hydrograph:

Corp of Engineers has indicated that The SCS triangular unit hydrograph with the curvilinear transformation be used for analysis.

Drainage area = 1943 acres (a)

Average slope = 2.8% (Y)

① Hydraulic length (L)

from drainage map, L = 11370 ft

Soil group C*, wood or forest land CN = 74**

$$S = \frac{1000}{CN} - 10 = 3.51$$

Lag time (L)

$$L = \frac{l^{.8}(S+1)^{.7}}{1900(Y)^{.5}}$$

$$L = \frac{(11370)^{.8}(4.51)^{.7}}{1900(2.8)^{.5}}$$

$$L = 1.58 \text{ hr.} \qquad T_c = \frac{L}{.6} = 2.64 \text{ hr.}$$

* County Soil Survey - Sussex NJ

** Table 2-2, SCS TR-55

BY VAU	DATE 9-19-80	Tranquility	JOB NO. 80195
CKD. PJ	DATE 9/20/81		SHEET NO. 2 OF

LANGAN ENGINEERING ASSOCIATES, INC.

② From Nomograph (Small Dams pg 71)

T_c for $\left\{\begin{matrix} L = 11370 \\ H = 318 \end{matrix}\right\}$ $T_c = .80$

$Lag = .6 T_c = .48$ hour (too small)

③ Estimate T_c from velocity & watercourse lengths

length = 11370 ft

avg. slope = 2.8%

avg velocity* = 2.5 ft/sec

$t_c = \frac{11370 \text{ ft}}{2.5 \text{ ft/sec}} = 4548 \text{ sec}$

$= 1.26$ hr

$Lag = .6(1.26) = 0.76$ hr

USE $L = 1.58$ hr (SCS)

* from Small dams pg 70.

BY VAL	DATE 9-19-80	Tranquility	JOB NO. 80145
CKD RJ	DATE 2-11-81		SHEET NO. 3 OF

LANGAN ENGINEERING ASSOCIATES, INC.

SPILLWAY CAPACITY

The spillway is similar to a broad crested weir therefore the equation $Q = CLH^{3/2}$ (where L = length, H = head, ft above crest) shall be used.

The crest of the weir which has a width of one foot is at elevation 98.5. The top of the weir is at elevation 101 which is the elevation of the bottom of the bridge over the weir.

The spillway is located approximately 100 ft to the east of beginning of the dam. This westerly portion of the dam is at elev. 102 while the easterly portion is at elev. 102.25.

At an elevation of 101, the spillway weir flow becomes orifice flow. The gate for the 2×2 sluiceway in the east abutment is inoperable in the closed position. Therefore, for the purpose of analysis, no outlet is assumed in the east abutment. (See plans & sections Figures 2a, 2b & 2c)

BY VAL DATE 9-19-91 Tranquility JOB NO. 88145

CKD. RJ DATE 9/20/91 SHEET NO. 4 OF

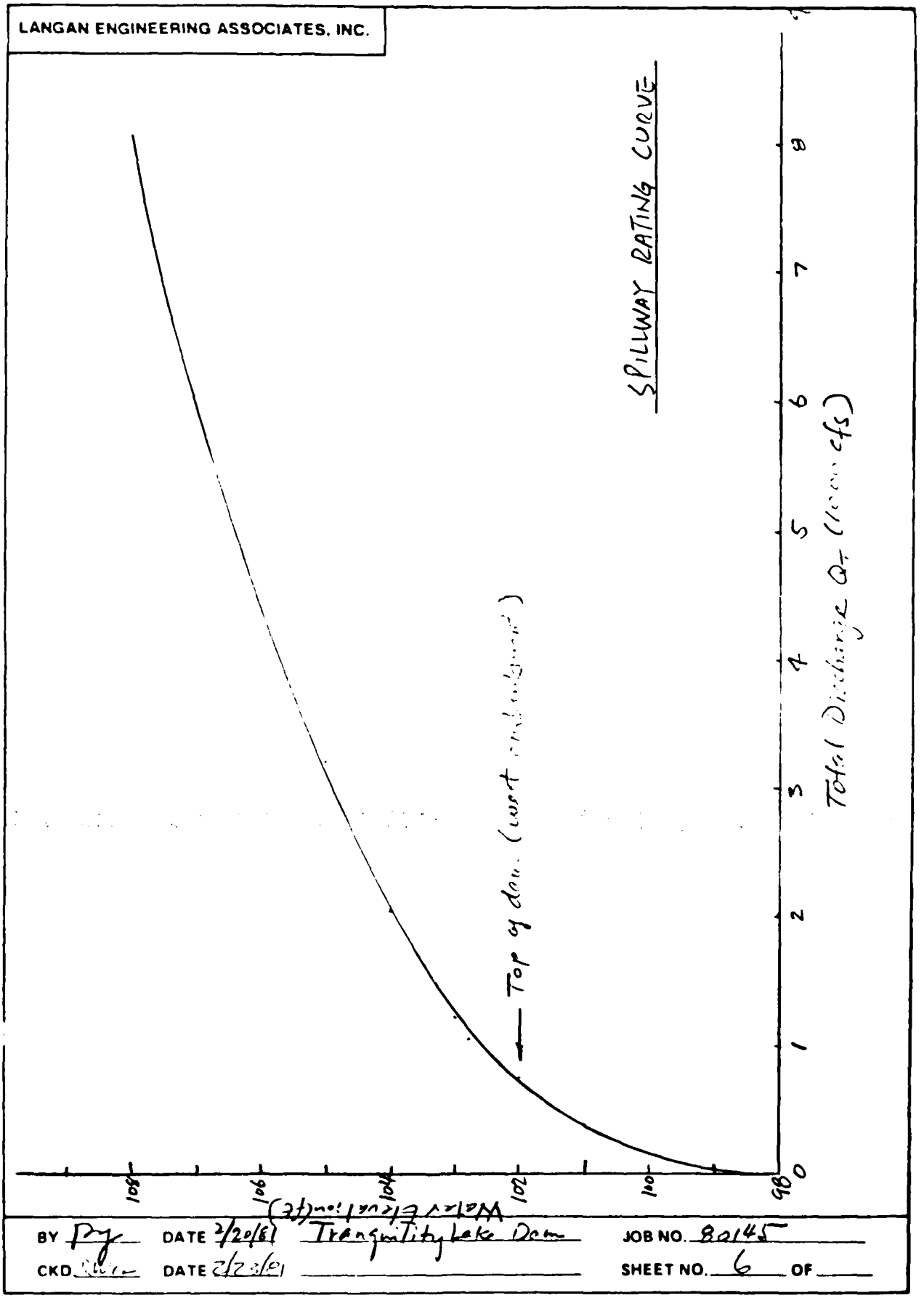
LANGAN ENGINEERING ASSOCIATES, INC.

BY VMU DATE 5/15/15
CKD Dmg DATE 5/20/15
JOB NO. 80145.
SHEET NO. 5 OF

ELEVATION (Ft)	SPILLWAY L=30', W=1'			WEST EMBANKMENT L=100' W=12'			EAST EMBANKMENT L=75' W=12'			ΣQ (cfs) $=Q_S+Q_E+Q_W$
	H(ft)	C	Q_S(cfs)	H(ft)	C	Q_W(cfs)	H(ft)	C	Q_E(cfs)	
98.5	0	—	0							0
99.0	0.5	2735	29							29
100.0	1.5	3.24	179							179
101.0	2.5	3.305	392							392
Becomes Orifice Flow										
102.0	2.25	.85	767	0	—	0				767
102.75	3.0	↓	886	0.75	2.68	174	0	—	0	1060
103.0	3.25		922	1	2.66	266	0.25	2.58	24	1212
103.5	3.75		991	1.5	2.65	487	0.75	2.68	131	1609
104.0	4.25		1055	2	2.63	744	1.25	2.66	279	2078
105.0	5.25		1172	3	2.63	1367	2.25	2.63	666	3205
107.0	7.25		1378	5	2.63	2940	4.25	2.63	1728	6046
109.0	9.25	.85	1556	7	2.63	4871	6.25	2.63	3082	9509

NOTE: 1) 2x2 Sluice ... : Q = 0
2.) Weir flow $Q = CLH^{3/2}$ calc. using C values from table 5-3, Handbook of H...
3) Orifice flow $Q = CA\sqrt{2gh}$ calc... C values from table 33, DES OF SMALL DAM...

LANGAN ENGINEERING ASSOCIATES, INC.



BY PMJ DATE 2/20/01 Tranquility Lake Dam JOB NO. 80145

CKD [illegible] DATE 2/23/01 SHEET NO. 6 OF

LANGAN ENGINEERING ASSOCIATES, INC.

Reservoir Storage Capacity

Assume a linear distribution for the area of the lake with elevation. Start at a Zero storage at the crest of the spillway.

Area of Lake = 50.6 ac

Length of equivalent square = 1484.6 ft

Take average side slope: 1V : 5 H

∴ for every foot of water above the crest of the spillway the length of the equivalent square increases by: 2×5×1 = 10 ft

Elevation (ft)	H (ft)	Length of Equiv. Square (ft)	Area of Lake (acres)
98.5	0	1484.6	50.6
99	.5	1489.6	50.9
100	1.5	1499.6	51.6
101	2.5	1509.6	52.3
102	3.5	1519.6	53.0
103	4.5	1529.6	53.7
104	5.5	1539.6	54.4
105	6.5	1549.6	55.1
109	10.5	1589.6	58.0

Storage Capacity vs. elevation is calculated by HEC 1

BY VK DATE 9/30 Tranquility JOB NO. 80195

CKD. DY DATE 10/8/81 SHEET NO. 7 OF

LANGAN ENGINEERING ASSOCIATES, INC.

SUMMARY OF HYDROGRAPH & FLOOD ROUTING

1) Hydrograph & routing calculated using HEC-1DB

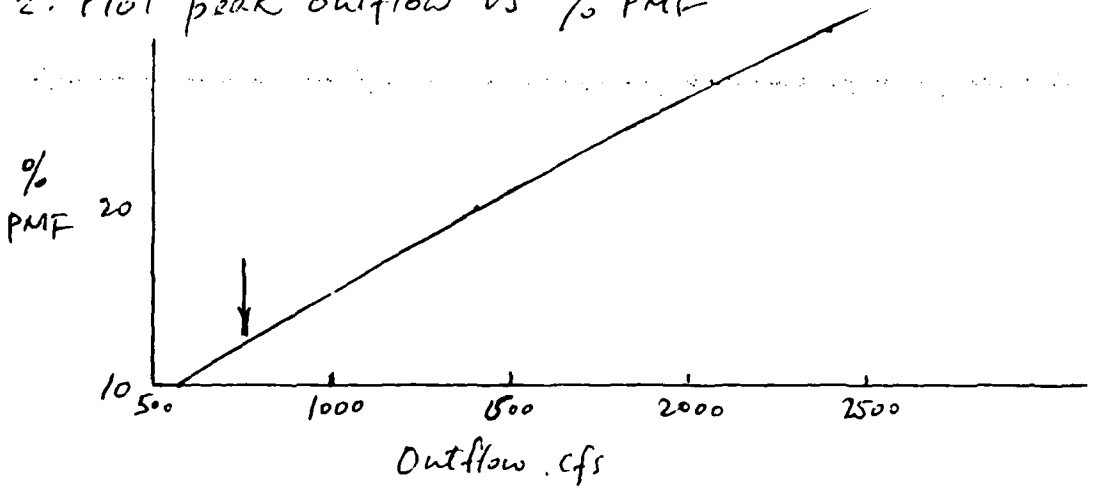
2) PMF for Lake Tranquility is 9109 cfs (routed to 8673)

3) Routing of PMF indicates that the dam will overtop by 6.52 feet

4) Routing of ½ PMF indicates that the dam will overtop by 3.73 feet.

OVERTOPPING POTENTIAL

1. Various % of PMF have been routed using HEC-1DB
2. Plot peak outflow vs % PMF



3. Dam overtops at elevation 102 with Q = 767 cfs
   ∴ dam can pass approx. 12 % of the PMF.

BY VAn DATE 4-19-80 Tranquility Dam JOB NO. 5015

CKD. Dry DATE 2/20/81 SHEET NO. 8 OF

LANGAN ENGINEERING ASSOCIATES, INC.

DRAWDOWN ANALYSIS

1.) Outlet Structure:

There presently exists a 2'x2' square "waste sluice" in the east wall of the spillway structure. A 2x2 gate which controls the flow is presently inoperable in the closed position. For this analysis we will assume that the gate is repaired & will be operational.

2.) Outlet Capacity

Invert of sluice ≃ 88.0 & elev 2x2 = 89.0

Spillway crest ≃ 98.5

apply equation for orifice flow $Q = CA\sqrt{2gh}$

where C = .85 for square edge entrance

water elev (ft)	Head (ft)	Q (cfs)
98.5	9.5	84
98	9.0	82
96	7.0	72
94	5.0	61
92	3.0	47
90	1.0	27
88	0	0

BY VKL DATE 1-11 Tranquility JOB NO. 80145

CKD. [illegible] DATE 4-11-11 Drawdown SHEET NO. 9 OF

LANGAN ENGINEERING ASSOCIATES, INC.

3) Storage Capacity

a) Use method of equivalent square as done in Reservoir Storage Capacity

b) Assume area at spillway crest = 50.6 ac with equiv. length = 1484.6 ft. (Side slope 1V:5H)

Water Elev. ft	Length of Equiv Sq. ft	Area ac	ΔH ft	Incr. Volume ac-ft	Volume ac-ft
98.5	1484.6	50.6			495
			.5	25.2	
98	1479.6	50.3			469.8
			2	99.2	
96	1459.6	48.9			370.6
			2	96.5	
94	1439.6	47.6			274.1
			2	93.9	
92	1419.6	46.3			180.2
			2	91.3	
90	1399.6	45.0			88.9
			2	88.7	
88	1379.6	43.7			0

BY VMA DATE 9-10-10 Tranquility JOB NO. 10145

CKD DJG DATE 9/10/10 Snowdon SHEET NO. 10 OF

LANGAN ENGINEERING ASSOCIATES, INC.

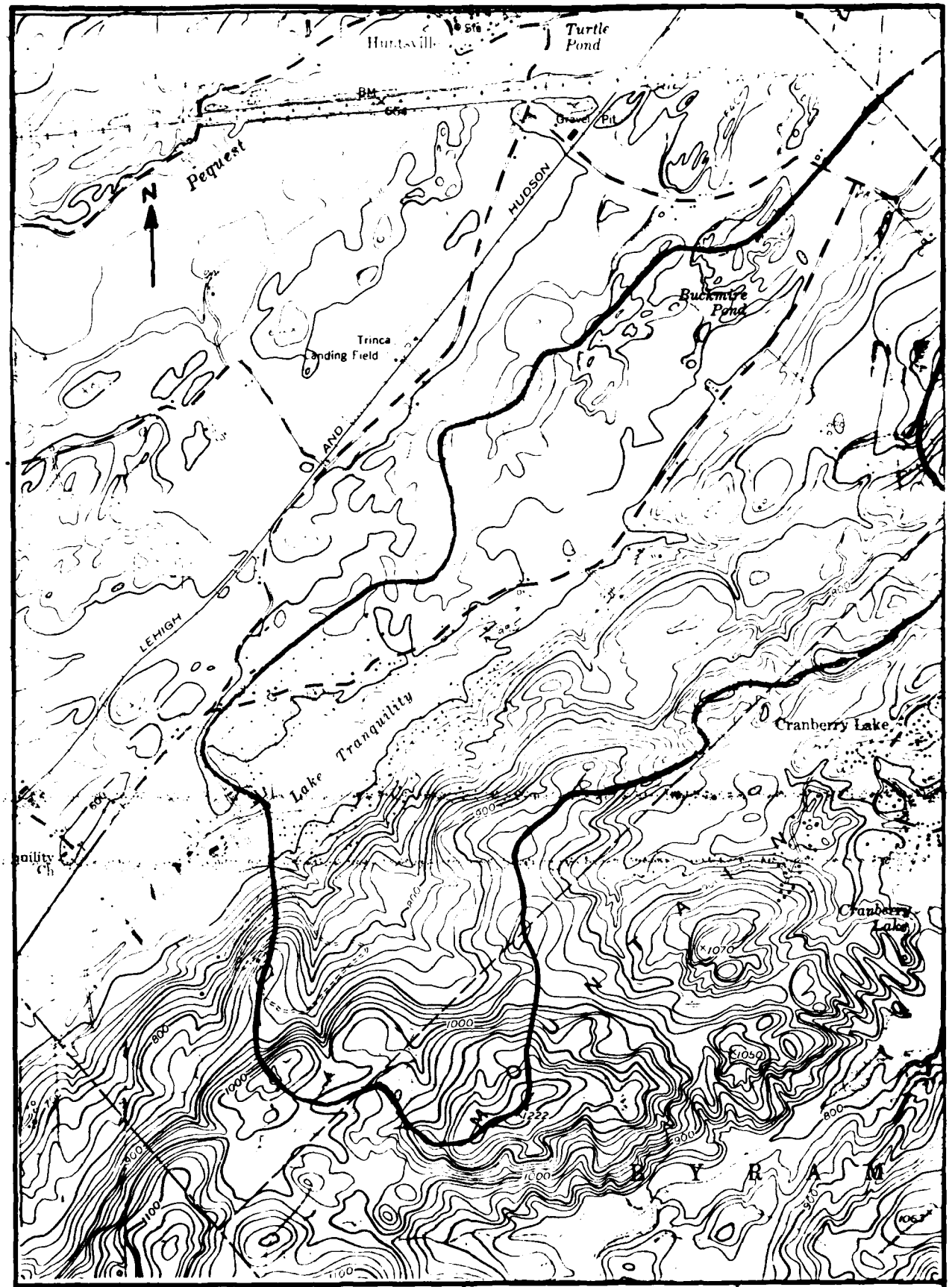
BY Lisa DATE 9.1.50 JOB NO. 80175
CKD Dry DATE 9/10/09 SHEET NO. 11 OF

Elev.	Qout	Qavg	Qnet	Storage ac-ft	Δt(hr)	Σ Δt hr	days
98.5	84	83	77	25.2	4.0		
98	82	77	71	99.2	16.9	20.9	
96	72	66.5	60.5	96.5	19.3	40.2	1.7 days
94	61	54	48	93.9	23.7	63.9	2.7 days
92	47	37	31	91.3	35.6	99.5	
90	27	13.5	7.5	88.7	143.1	242.6	
88	0						

Assume inflow to be 2 cfs/sq.mi
= 3.03 x 2 = 6 cfs

Qnet = Qavg - 6

Lake can be drawn down 6½ ft in about 3 days



DRAINAGE BASIN TRANQUILITY DAM	MAP SOURCE USGS TRANQUILITY SCALE 1"=2000'	PROJ NO J80145 SHEET ____ OF ____

LANGAN ENGINEERING ASSOCIATES, INC.

HEC-1 OUTPUT

LAKE TRANQUILITY DAM

```
TRANOUT     17:21 FEB  ..'81

1**********************************
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION       JULY 1978
   LAST MODIFICATION  26 FEB 79
 **********************************
      1             A1            TRANQUILITY LAKE DAM (00275)
      2             A2            INFLOW HYDROGRAPHY AND ROUTING
      3             A3            N J DAM INSPECTION
      4             B     290       0      10       0       0       0       0       0       0       0
      5             B1      3
      6             K       0       1                                       1
      7             K1  COMPUTE HYDROGRAPH
      8             M       1       2    3.03                     .30
      9             P       0    22.0     112     123     132     142
     10             T                                                       1     .15
     11             W2            1.58
     12             X      -2               1
     13             K       1       2                                       1
     14             K1  ROUTING COMPUTATIONS
     15             Y                                 1
     16             Y1      1                                                      -1
     17             Y4   98.5      99     100     101     102  102.75     103   103.5     104   105.0
     18             Y4  107.0   109.0
     19             Y5      0      29     179     392     767    1060    1212    1609    2078    3205
     20             Y5   6046    9509
     21             $A   50.6    50.9    51.6    52.3    53.0    53.7    54.4    55.1    58.0
     22             $E   98.5      99     100     101     102     103     104     105     109
     23             $$   98.5
     24             $D  102.0
     25             K      99
1                           PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                                     RUNOFF HYDROGRAPH AT             1
                                     ROUTE HYDROGRAPH TO              2
                                     END OF NETWORK


1**********************************
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION       JULY 1978
   LAST MODIFICATION  26 FEB 79
 **********************************

 RUN   DATE# 81/02/20.
       TIME# 17.19.56.


                              TRANQUILITY LAKE DAM (00275)
                              INFLOW HYDROGRAPHY AND ROUTING
                              N J DAM INSPECTION

                                         JOB SPECIFICATION
                    NQ      NHR     NMIN     IDAY      IHR     IMIN    METRC     IPLT     IPRT    NSTAN
                   290        0       10        0        0        0        0        0        0        0
                                           JOPER      NWT    LROPT    TRACE
                                               3        0        0        0

          **********          **********          **********          **********          **********
```

COMPUTE HYDROGRAPH

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	3.03	0.00	3.03	.80	0.000	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.00	112.00	123.00	132.00	142.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.15	0.00	0.00

UNIT HYDROGRAPH DATA

TC= 0.00 LAG= 1.58

RECESSION DATA

STRTQ= -2.00 QRCSN= 0.00 RTIOR= 1.00

UNIT HYDROGRAPH 49 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= 1.58 VOL= 1.00

27.	88.	168.	274.	415.	582.	723.	819.	871.	879.
870.	816.	755.	684.	595.	490.	402.	341.	289.	245.
213.	181.	154.	128.	111.	93.	80.	67.	57.	48.
41.	35.	30.	25.	22.	18.	16.	13.	11.	10.
9.	7.	6.	5.	4.	3.	3.	2.	1.	

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.10	1	.00	0.00	.00	6.	1.02	.20	146	.02	0.00	.02	6.
1.01	.20	2	.00	0.00	.00	6.	1.02	.30	147	.02	0.00	.02	6.
1.01	.30	3	.00	0.00	.00	6.	1.02	.40	148	.02	0.00	.02	6.
1.01	.40	4	.00	0.00	.00	6.	1.02	.50	149	.02	0.00	.02	6.
1.01	.50	5	.00	0.00	.00	6.	1.02	1.00	150	.02	0.00	.02	6.
1.01	1.00	6	.00	0.00	.00	6.	1.02	1.10	151	.02	0.00	.02	6.
1.01	1.10	7	.00	0.00	.00	6.	1.02	1.20	152	.02	0.00	.02	6.
1.01	1.20	8	.00	0.00	.00	6.	1.02	1.30	153	.02	0.00	.02	6.
1.01	1.30	9	.00	0.00	.00	6.	1.02	1.40	154	.02	0.00	.02	6.
1.01	1.40	10	.00	0.00	.00	6.	1.02	1.50	155	.02	0.00	.02	6.
1.01	1.50	11	.00	0.00	.00	6.	1.02	2.00	156	.02	0.00	.02	6.
1.01	2.00	12	.00	0.00	.00	6.	1.02	2.10	157	.02	0.00	.02	6.
1.01	2.10	13	.00	0.00	.00	6.	1.02	2.20	158	.02	0.00	.02	6.
1.01	2.20	14	.00	0.00	.00	6.	1.02	2.30	159	.02	0.00	.02	6.
1.01	2.30	15	.00	0.00	.00	6.	1.02	2.40	160	.02	0.00	.02	6.
1.01	2.40	16	.00	0.00	.00	6.	1.02	2.50	161	.02	0.00	.02	6.
1.01	2.50	17	.00	0.00	.00	6.	1.02	3.00	162	.02	0.00	.02	6.
1.01	3.00	18	.00	0.00	.00	6.	1.02	3.10	163	.02	0.00	.02	6.
1.01	3.10	19	.00	0.00	.00	6.	1.02	3.20	164	.02	0.00	.02	6.
1.01	3.20	20	.00	0.00	.00	6.	1.02	3.30	165	.02	0.00	.02	6.
1.01	3.30	21	.00	0.00	.00	6.	1.02	3.40	166	.02	0.00	.02	6.
1.01	3.40	22	.00	0.00	.00	6.	1.02	3.50	167	.02	0.00	.02	6.
1.01	3.50	23	.00	0.00	.00	6.	1.02	4.00	168	.02	0.00	.02	6.
1.01	4.00	24	.00	0.00	.00	6.	1.02	4.10	169	.02	0.00	.02	6.
1.01	4.10	25	.00	0.00	.00	6.	1.02	4.20	170	.02	0.00	.02	6.
1.01	4.20	26	.00	0.00	.00	6.	1.02	4.30	171	.02	0.00	.02	6.
1.01	4.30	27	.00	0.00	.00	6.	1.02	4.40	172	.02	0.00	.02	6.
1.01	4.40	28	.00	0.00	.00	6.	1.02	4.50	173	.02	0.00	.02	6.
1.01	4.50	29	.00	0.00	.00	6.	1.02	5.00	174	.02	0.00	.02	6.
1.01	5.00	30	.00	0.00	.00	6.	1.02	5.10	175	.02	0.00	.02	6.
1.01	5.10	31	.00	0.00	.00	6.	1.02	5.20	176	.02	0.00	.02	6.

1.01	5.20	32	.00	0.00	.00	6.	1.02	5.30	177	.02	0.00	.02	6.
1.01	5.30	33	.00	0.00	.00	6.	1.02	5.40	178	.02	0.00	.02	6.
1.01	5.40	34	.00	0.00	.00	6.	1.02	5.50	179	.02	0.00	.02	6.
1.01	5.50	35	.00	0.00	.00	6.	1.02	6.00	180	.02	0.00	.02	6.
1.01	6.00	36	.00	0.00	.00	6.	1.02	6.10	181	.05	.03	.03	7.
1.01	6.10	37	.00	0.00	.00	6.	1.02	6.20	182	.05	.03	.03	9.
1.01	6.20	38	.00	0.00	.00	6.	1.02	6.30	183	.05	.03	.03	14.
1.01	6.30	39	.00	0.00	.00	6.	1.02	6.40	184	.05	.03	.03	22.
1.01	6.40	40	.00	0.00	.00	6.	1.02	6.50	185	.05	.03	.03	34.
1.01	6.50	41	.00	0.00	.00	6.	1.02	7.00	186	.05	.03	.03	51.
1.01	7.00	42	.00	0.00	.00	6.	1.02	7.10	187	.05	.03	.03	72.
1.01	7.10	43	.00	0.00	.00	6.	1.02	7.20	188	.05	.03	.03	95.
1.01	7.20	44	.00	0.00	.00	6.	1.02	7.30	189	.05	.03	.03	120.
1.01	7.30	45	.00	0.00	.00	6.	1.02	7.40	190	.05	.03	.03	145.
1.01	7.40	46	.00	0.00	.00	6.	1.02	7.50	191	.05	.03	.03	171.
1.01	7.50	47	.00	0.00	.00	6.	1.02	8.00	192	.05	.03	.03	194.
1.01	8.00	48	.00	0.00	.00	6.	1.02	8.10	193	.05	.03	.03	216.
1.01	8.10	49	.00	0.00	.00	6.	1.02	8.20	194	.05	.03	.03	235.
1.01	8.20	50	.00	0.00	.00	6.	1.02	8.30	195	.05	.03	.03	253.
1.01	8.30	51	.00	0.00	.00	6.	1.02	8.40	196	.05	.03	.03	267.
1.01	8.40	52	.00	0.00	.00	6.	1.02	8.50	197	.05	.03	.03	278.
1.01	8.50	53	.00	0.00	.00	6.	1.02	9.00	198	.05	.03	.03	288.
1.01	9.00	54	.00	0.00	.00	6.	1.02	9.10	199	.05	.03	.03	296.
1.01	9.10	55	.00	0.00	.00	6.	1.02	9.20	200	.05	.03	.03	303.
1.01	9.20	56	.00	0.00	.00	6.	1.02	9.30	201	.05	.03	.03	309.
1.01	9.30	57	.00	0.00	.00	6.	1.02	9.40	202	.05	.03	.03	315.
1.01	9.40	58	.00	0.00	.00	6.	1.02	9.50	203	.05	.03	.03	319.
1.01	9.50	59	.00	0.00	.00	6.	1.02	10.00	204	.05	.03	.03	323.
1.01	10.00	60	.00	0.00	.00	6.	1.02	10.10	205	.05	.03	.03	326.
1.01	10.10	61	.00	0.00	.00	6.	1.02	10.20	206	.05	.03	.03	329.
1.01	10.20	62	.00	0.00	.00	6.	1.02	10.30	207	.05	.03	.03	331.
1.01	10.30	63	.00	0.00	.00	6.	1.02	10.40	208	.05	.03	.03	333.
1.01	10.40	64	.00	0.00	.00	6.	1.02	10.50	209	.05	.03	.03	335.
1.01	10.50	65	.00	0.00	.00	6.	1.02	11.00	210	.05	.03	.03	336.
1.01	11.00	66	.00	0.00	.00	6.	1.02	11.10	211	.05	.03	.03	337.
1.01	11.10	67	.00	0.00	.00	6.	1.02	11.20	212	.05	.03	.03	338.
1.01	11.20	68	.00	0.00	.00	6.	1.02	11.30	213	.05	.03	.03	339.
1.01	11.30	69	.00	0.00	.00	6.	1.02	11.40	214	.05	.03	.03	340.
1.01	11.40	70	.00	0.00	.00	6.	1.02	11.50	215	.05	.03	.03	340.
1.01	11.50	71	.00	0.00	.00	6.	1.02	12.00	216	.05	.03	.03	341.
1.01	12.00	72	.00	0.00	.00	6.	1.02	12.10	217	.33	.30	.03	349.
1.01	12.10	73	.02	0.00	.02	6.	1.02	12.20	218	.33	.30	.03	373.
1.01	12.20	74	.02	0.00	.02	6.	1.02	12.30	219	.33	.30	.03	420.
1.01	12.30	75	.02	0.00	.02	6.	1.02	12.40	220	.33	.30	.03	495.
1.01	12.40	76	.02	0.00	.02	6.	1.02	12.50	221	.33	.30	.03	609.
1.01	12.50	77	.02	0.00	.02	6.	1.02	13.00	222	.33	.30	.03	770.
1.01	13.00	78	.02	0.00	.02	6.	1.02	13.10	223	.39	.37	.03	970.
1.01	13.10	79	.03	0.00	.03	6.	1.02	13.20	224	.39	.37	.03	1201.
1.01	13.20	80	.03	0.00	.03	6.	1.02	13.30	225	.39	.37	.03	1451.
1.01	13.30	81	.03	0.00	.03	6.	1.02	13.40	226	.39	.37	.03	1711.
1.01	13.40	82	.03	0.00	.03	6.	1.02	13.50	227	.39	.37	.03	1977.
1.01	13.50	83	.03	0.00	.03	6.	1.02	14.00	228	.39	.37	.03	2240.
1.01	14.00	84	.03	0.00	.03	6.	1.02	14.10	229	.49	.47	.03	2497.
1.01	14.10	85	.04	0.00	.04	6.	1.02	14.20	230	.49	.47	.03	2748.
1.01	14.20	86	.04	0.00	.04	6.	1.02	14.30	231	.49	.47	.03	2985.
1.01	14.30	87	.04	0.00	.04	6.	1.02	14.40	232	.49	.47	.03	3204.
1.01	14.40	88	.04	0.00	.04	6.	1.02	14.50	233	.49	.47	.03	3413.
1.01	14.50	89	.04	0.00	.04	6.	1.02	15.00	234	.49	.47	.03	3618.
1.01	15.00	90	.04	0.00	.04	6.	1.02	15.10	235	.45	.42	.03	3817.
1.01	15.10	91	.03	0.00	.03	6.	1.02	15.20	236	.75	.72	.03	4014.
1.01	15.20	92	.06	0.00	.06	6.	1.02	15.30	237	1.35	1.32	.03	4232.
1.01	15.30	93	.10	0.00	.10	6.	1.02	15.40	238	1.37	1.35	.03	4545.
1.01	15.40	94	.26	.18	.08	11.	1.02	15.50	239	.97	.95	.03	4980.
1.01	15.50	95	.07	.05	.03	23.	1.02	16.00	240	.60	.57	.03	5499.
1.01	16.00	96	.05	.02	.03	40.	1.02	16.10	241	.46	.43	.03	6129.
1.01	16.10	97	.03	.01	.01	48.	1.02	16.20	242	.44	.43	.01	6874.

1.01	16.20	98	.03	.01	.03	97.	1.02	16.50	243	.46	.43	.03	7668.
1.01	16.30	99	.03	.01	.03	137.	1.02	16.40	244	.46	.43	.03	8332.
1.01	16.40	100	.03	.01	.03	176.	1.02	16.50	245	.46	.43	.03	8794.
1.01	16.50	101	.03	.01	.03	207.	1.02	17.00	246	.46	.43	.03	9048.
1.01	17.00	102	.03	.01	.03	230.	1.02	17.10	247	.36	.34	.03	9109.
1.01	17.10	103	.03	.00	.03	243.	1.02	17.20	248	.36	.34	.03	9037.
1.01	17.20	104	.03	.00	.03	250.	1.02	17.30	249	.36	.34	.03	8802.
1.01	17.30	105	.03	.00	.03	247.	1.02	17.40	250	.36	.34	.03	8492.
1.01	17.40	106	.03	.00	.03	240.	1.02	17.50	251	.36	.34	.03	8108.
1.01	17.50	107	.03	.00	.03	229.	1.02	18.00	252	.36	.34	.03	7639.
1.01	18.00	108	.03	.00	.03	212.	1.02	18.10	253	.03	.00	.03	7112.
1.01	18.10	109	.00	0.00	.00	190.	1.02	18.20	254	.03	.00	.03	6619.
1.01	18.20	110	.00	0.00	.00	168.	1.02	18.30	255	.03	.00	.03	6186.
1.01	18.30	111	.00	0.00	.00	150.	1.02	18.40	256	.03	.00	.03	5768.
1.01	18.40	112	.00	0.00	.00	133.	1.02	18.50	257	.03	.00	.03	5348.
1.01	18.50	113	.00	0.00	.00	118.	1.02	19.00	258	.03	.00	.03	4917.
1.01	19.00	114	.00	0.00	.00	105.	1.02	19.10	259	.03	.00	.03	4457.
1.01	19.10	115	.00	0.00	.00	93.	1.02	19.20	260	.03	.00	.03	3993.
1.01	19.20	116	.00	0.00	.00	81.	1.02	19.30	261	.03	.00	.03	3530.
1.01	19.30	117	.00	0.00	.00	70.	1.02	19.40	262	.03	.00	.03	3102.
1.01	19.40	118	.00	0.00	.00	61.	1.02	19.50	263	.03	.00	.03	2694.
1.01	19.50	119	.00	0.00	.00	53.	1.02	20.00	264	.03	.00	.03	2323.
1.01	20.00	120	.00	0.00	.00	47.	1.02	20.10	265	.03	.00	.03	1985.
1.01	20.10	121	.00	0.00	.00	41.	1.02	20.20	266	.03	.00	.03	1685.
1.01	20.20	122	.00	0.00	.00	35.	1.02	20.30	267	.03	.00	.03	1423.
1.01	20.30	123	.00	0.00	.00	31.	1.02	20.40	268	.03	.00	.03	1209.
1.01	20.40	124	.00	0.00	.00	27.	1.02	20.50	269	.03	.00	.03	1030.
1.01	20.50	125	.00	0.00	.00	24.	1.02	21.00	270	.03	.00	.03	880.
1.01	21.00	126	.00	0.00	.00	21.	1.02	21.10	271	.03	.00	.03	751.
1.01	21.10	127	.00	0.00	.00	19.	1.02	21.20	272	.03	.00	.03	642.
1.01	21.20	128	.00	0.00	.00	17.	1.02	21.30	273	.03	.00	.03	548.
1.01	21.30	129	.00	0.00	.00	15.	1.02	21.40	274	.03	.00	.03	468.
1.01	21.40	130	.00	0.00	.00	14.	1.02	21.50	275	.03	.00	.03	399.
1.01	21.50	131	.00	0.00	.00	13.	1.02	22.00	276	.03	.00	.03	342.
1.01	22.00	132	.00	0.00	.00	12.	1.02	22.10	277	.03	.00	.03	294.
1.01	22.10	133	.00	0.00	.00	11.	1.02	22.20	278	.03	.00	.03	253.
1.01	22.20	134	.00	0.00	.00	10.	1.02	22.30	279	.03	.00	.03	218.
1.01	22.30	135	.00	0.00	.00	10.	1.02	22.40	280	.03	.00	.03	188.
1.01	22.40	136	.00	0.00	.00	9.	1.02	22.50	281	.03	.00	.03	162.
1.01	22.50	137	.00	0.00	.00	9.	1.02	23.00	282	.03	.00	.03	139.
1.01	23.00	138	.00	0.00	.00	8.	1.02	23.10	283	.03	.00	.03	119.
1.01	23.10	139	.00	0.00	.00	8.	1.02	23.20	284	.03	.00	.03	102.
1.01	23.20	140	.00	0.00	.00	8.	1.02	23.30	285	.03	.00	.03	87.
1.01	23.30	141	.00	0.00	.00	7.	1.02	23.40	286	.03	.00	.03	74.
1.01	23.40	142	.00	0.00	.00	7.	1.02	23.50	287	.03	.00	.03	63.
1.01	23.50	143	.00	0.00	.00	7.	1.03	0.00	288	.03	.00	.03	55.
1.02	0.00	144	.00	0.00	.00	6.	1.03	.10	289	0.00	0.00	0.00	49.
1.02	.10	145	.02	0.00	.02	6.	1.03	.20	290	0.00	0.00	0.00	44.
									SUM	24.99	20.22	4.77	238590.
										(635.)	(514.)	(121.)	(6756.12)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	9109.	5544.	1625.	823.	238572.
CMS	258.	157.	46.	23.	6756.
INCHES		17.02	19.95	20.35	20.35
MM		432.33	506.77	516.77	516.77
AC-FT		2749.	3223.	3286.	3286.
THOUS CU M		3391.	3975.	4053.	4053.

ROUTING COMPUTATIONS

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	LSTR
0.0	0.000	0.00	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	0.	-1

STAGE	98.50	99.00	100.00	101.00	102.00	102.25	103.00	103.50	104.00	105.00
	107.00	109.00								
FLOW	0.00	29.00	179.00	392.00	767.00	1060.00	1212.00	1609.00	2078.00	3205.00
	6046.00	9509.00								
SURFACE AREA=	51.	51.	52.	52.	53.	54.	54.	55.	58.	
CAPACITY=	0.	25.	77.	129.	181.	235.	289.	343.	570.	
ELEVATION=	99.	99.	100.	101.	102.	102.	104.	105.	109.	

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
98.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
102.0	0.0	0.0	0.

END-OF-PERIOD HYDROGRAPH ORDINATES

MO.DA	HR.MN	PERIOD	HOURS	INFLOW	OUTFLOW	STORAGE	STAGE
1.01	.10	1	.17	6.	0.	0.	98.5
1.01	.20	2	.33	6.	0.	0.	98.5
1.01	.30	3	.50	6.	0.	0.	98.5
1.01	.40	4	.67	6.	0.	0.	98.5
1.01	.50	5	.83	6.	0.	0.	98.5
1.01	1.00	6	1.00	6.	1.	0.	98.5
1.01	1.10	7	1.17	6.	1.	1.	98.5
1.01	1.20	8	1.33	6.	1.	1.	98.5
1.01	1.30	9	1.50	6.	1.	1.	98.5
1.01	1.40	10	1.67	6.	1.	1.	98.5
1.01	1.50	11	1.83	6.	1.	1.	98.5
1.01	2.00	12	2.00	6.	1.	1.	98.5
1.01	2.10	13	2.17	6.	1.	1.	98.5
1.01	2.20	14	2.33	6.	1.	1.	98.5
1.01	2.30	15	2.50	6.	1.	1.	98.5
1.01	2.40	16	2.67	6.	1.	1.	98.5
1.01	2.50	17	2.83	6.	1.	1.	98.5
1.01	3.00	18	3.00	6.	1.	1.	98.5
1.01	3.10	19	3.17	6.	2.	1.	98.5
1.01	3.20	20	3.33	6.	2.	1.	98.5
1.01	3.30	21	3.50	6.	2.	1.	98.5
1.01	3.40	22	3.67	6.	2.	2.	98.5
1.01	3.50	23	3.83	6.	2.	2.	98.5
1.01	4.00	24	4.00	6.	2.	2.	98.5
1.01	4.10	25	4.17	6.	2.	2.	98.5
1.01	4.20	26	4.33	6.	2.	2.	98.5
1.01	4.30	27	4.50	6.	2.	2.	98.5
1.01	4.40	28	4.67	6.	2.	2.	98.5
1.01	4.50	29	4.83	6.	2.	2.	98.5
1.01	5.00	30	5.00	6.	2.	2.	98.5

1.01	5.20	32	5.33	6.	2.	2.	98.5
1.01	5.30	33	5.50	6.	2.	2.	98.5
1.01	5.40	34	5.67	6.	3.	2.	98.5
1.01	5.50	35	5.83	6.	3.	2.	98.5
1.01	6.00	36	6.00	6.	3.	2.	98.5
1.01	6.10	37	6.17	6.	3.	2.	98.5
1.01	6.20	38	6.33	6.	3.	2.	98.5
1.01	6.30	39	6.50	6.	3.	2.	98.5
1.01	6.40	40	6.67	6.	3.	2.	98.5
1.01	6.50	41	6.83	6.	3.	3.	98.5
1.01	7.00	42	7.00	6.	3.	3.	98.6
1.01	7.10	43	7.17	6.	3.	3.	98.6
1.01	7.20	44	7.33	6.	3.	3.	98.6
1.01	7.30	45	7.50	6.	3.	3.	98.6
1.01	7.40	46	7.67	6.	3.	3.	98.6
1.01	7.50	47	7.83	6.	3.	3.	98.6
1.01	8.00	48	8.00	6.	3.	3.	98.6
1.01	8.10	49	8.17	6.	3.	3.	98.6
1.01	8.20	50	8.33	6.	3.	3.	98.6
1.01	8.30	51	8.50	6.	3.	3.	98.6
1.01	8.40	52	8.67	6.	3.	3.	98.6
1.01	8.50	53	8.83	6.	3.	3.	98.6
1.01	9.00	54	9.00	6.	3.	3.	98.6
1.01	9.10	55	9.17	6.	4.	3.	98.6
1.01	9.20	56	9.33	6.	4.	3.	98.6
1.01	9.30	57	9.50	6.	4.	3.	98.6
1.01	9.40	58	9.67	6.	4.	3.	98.6
1.01	9.50	59	9.83	6.	4.	3.	98.6
1.01	10.00	60	10.00	6.	4.	3.	98.6
1.01	10.10	61	10.17	6.	4.	3.	98.6
1.01	10.20	62	10.33	6.	4.	3.	98.6
1.01	10.30	63	10.50	6.	4.	3.	98.6
1.01	10.40	64	10.67	6.	4.	3.	98.6
1.01	10.50	65	10.83	6.	4.	3.	98.6
1.01	11.00	66	11.00	6.	4.	3.	98.6
1.01	11.10	67	11.17	6.	4.	3.	98.6
1.01	11.20	68	11.33	6.	4.	3.	98.6
1.01	11.30	69	11.50	6.	4.	4.	98.6
1.01	11.40	70	11.67	6.	4.	4.	98.6
1.01	11.50	71	11.83	6.	4.	4.	98.6
1.01	12.00	72	12.00	6.	4.	4.	98.6
1.01	12.10	73	12.17	6.	4.	4.	98.6
1.01	12.20	74	12.33	6.	4.	4.	98.6
1.01	12.30	75	12.50	6.	4.	4.	98.6
1.01	12.40	76	12.67	6.	4.	4.	98.6
1.01	12.50	77	12.83	6.	4.	4.	98.6
1.01	13.00	78	13.00	6.	4.	4.	98.6
1.01	13.10	79	13.17	6.	4.	4.	98.6
1.01	13.20	80	13.33	6.	4.	4.	98.6
1.01	13.30	81	13.50	6.	4.	4.	98.6
1.01	13.40	82	13.67	6.	4.	4.	98.6
1.01	13.50	83	13.83	6.	4.	4.	98.6
1.01	14.00	84	14.00	6.	4.	4.	98.6
1.01	14.10	85	14.17	6.	4.	4.	98.6
1.01	14.20	86	14.33	6.	4.	4.	98.6
1.01	14.30	87	14.50	6.	5.	4.	98.6
1.01	14.40	88	14.67	6.	5.	4.	98.6
1.01	14.50	89	14.83	6.	5.	4.	98.6
1.01	15.00	90	15.00	6.	5.	4.	98.6
1.01	15.10	91	15.17	6.	5.	4.	98.6
1.01	15.20	92	15.33	6.	5.	4.	98.6
1.01	15.30	93	15.50	6.	5.	4.	98.6
1.01	15.40	94	15.67	11.	5.	4.	98.6
1.01	15.50	95	15.83	21.	5.	4.	98.6
1.01	16.00	96	16.00	40.	5.	5.	98.6

1.01	16.20	99	16.33	143.	9.	8.	98.6
1.01	16.30	99	16.50	137.	9.	8.	98.7
1.01	16.40	100	16.67	178.	11.	10.	98.7
1.01	16.50	101	16.83	207.	14.	12.	98.7
1.01	17.00	102	17.00	230.	17.	15.	98.8
1.01	17.10	103	17.17	243.	21.	18.	98.9
1.01	17.20	104	17.33	250.	24.	21.	98.9
1.01	17.30	105	17.50	247.	28.	24.	99.0
1.01	17.40	106	17.67	240.	34.	27.	99.0
1.01	17.50	107	17.83	229.	42.	30.	99.1
1.01	18.00	108	18.00	212.	49.	32.	99.1
1.01	18.10	109	18.17	190.	55.	34.	99.2
1.01	18.20	110	18.33	168.	60.	36.	99.2
1.01	18.30	111	18.50	150.	64.	37.	99.2
1.01	18.40	112	18.67	133.	67.	38.	99.3
1.01	18.50	113	18.83	118.	70.	39.	99.3
1.01	19.00	114	19.00	105.	71.	40.	99.3
1.01	19.10	115	19.17	93.	72.	40.	99.3
1.01	19.20	116	19.33	81.	73.	40.	99.3
1.01	19.30	117	19.50	70.	73.	40.	99.3
1.01	19.40	118	19.67	61.	73.	40.	99.3
1.01	19.50	119	19.83	53.	72.	40.	99.3
1.01	20.00	120	20.00	47.	71.	40.	99.3
1.01	20.10	121	20.17	41.	70.	39.	99.3
1.01	20.20	122	20.33	35.	69.	39.	99.3
1.01	20.30	123	20.50	31.	67.	38.	99.3
1.01	20.40	124	20.67	27.	66.	38.	99.2
1.01	20.50	125	20.83	24.	64.	37.	99.2
1.01	21.00	126	21.00	21.	63.	37.	99.2
1.01	21.10	127	21.17	19.	61.	36.	99.2
1.01	21.20	128	21.33	17.	59.	36.	99.2
1.01	21.30	129	21.50	15.	58.	35.	99.2
1.01	21.40	130	21.67	14.	56.	35.	99.2
1.01	21.50	131	21.83	13.	54.	34.	99.2
1.01	22.00	132	22.00	12.	53.	33.	99.2
1.01	22.10	133	22.17	11.	51.	33.	99.1
1.01	22.20	134	22.33	10.	49.	32.	99.1
1.01	22.30	135	22.50	10.	48.	32.	99.1
1.01	22.40	136	22.67	9.	46.	31.	99.1
1.01	22.50	137	22.83	9.	45.	31.	99.1
1.01	23.00	138	23.00	8.	43.	30.	99.1
1.01	23.10	139	23.17	8.	42.	30.	99.1
1.01	23.20	140	23.33	8.	41.	29.	99.1
1.01	23.30	141	23.50	7.	39.	29.	99.1
1.01	23.40	142	23.67	7.	38.	28.	99.1
1.01	23.50	143	23.83	7.	37.	28.	99.1
1.02	0.00	144	24.00	6.	36.	28.	99.0
1.02	.10	145	24.17	6.	34.	27.	99.0
1.02	.20	146	24.33	6.	33.	27.	99.0
1.02	.30	147	24.50	6.	32.	26.	99.0
1.02	.40	148	24.67	6.	31.	26.	99.0
1.02	.50	149	24.83	6.	30.	26.	99.0
1.02	1.00	150	25.00	6.	29.	25.	99.0
1.02	1.10	151	25.17	6.	29.	25.	99.0
1.02	1.20	152	25.33	6.	28.	25.	99.0
1.02	1.30	153	25.50	6.	28.	25.	99.0
1.02	1.40	154	25.67	6.	28.	24.	99.0
1.02	1.50	155	25.83	6.	27.	24.	99.0
1.02	2.00	156	26.00	6.	27.	24.	99.0
1.02	2.10	157	26.17	6.	27.	23.	99.0
1.02	2.20	158	26.33	6.	26.	23.	99.0
1.02	2.30	159	26.50	6.	26.	23.	98.9
1.02	2.40	160	26.67	6.	26.	23.	98.9
1.02	2.50	161	26.83	6.	25.	22.	98.9
1.02	3.00	162	27.00	6.	25.	22.	98.9
1.02	3.10	163	27.17	6.	25.	22.	98.9

1.02	3.20	164	27.33	5.	24.	21.	98.9
1.02	3.30	165	27.50	5.	24.	21.	98.9
1.02	3.40	166	27.67	5.	24.	21.	98.9
1.02	3.50	167	27.83	6.	24.	21.	98.9
1.02	4.00	168	28.00	5.	23.	20.	98.9
1.02	4.10	169	28.17	5.	23.	20.	98.9
1.02	4.20	170	28.33	6.	23.	20.	98.9
1.02	4.30	171	28.50	5.	23.	20.	98.9
1.02	4.40	172	28.67	5.	22.	20.	98.9
1.02	4.50	173	28.83	5.	22.	19.	98.9
1.02	5.00	174	29.00	6.	22.	19.	98.9
1.02	5.10	175	29.17	5.	22.	19.	98.9
1.02	5.20	176	29.33	6.	21.	19.	98.9
1.02	5.30	177	29.50	5.	21.	18.	98.9
1.02	5.40	178	29.67	5.	21.	18.	98.9
1.02	5.50	179	29.83	6.	21.	18.	98.9
1.02	6.00	180	30.00	6.	20.	18.	98.9
1.02	6.10	181	30.17	7.	20.	18.	98.8
1.02	6.20	182	30.33	9.	20.	18.	98.8
1.02	6.30	183	30.50	14.	20.	17.	98.8
1.02	6.40	184	30.67	22.	20.	17.	98.8
1.02	6.50	185	30.83	34.	20.	17.	98.8
1.02	7.00	186	31.00	51.	20.	18.	98.9
1.02	7.10	187	31.17	72.	21.	18.	98.9
1.02	7.20	188	31.33	95.	22.	19.	98.9
1.02	7.30	189	31.50	120.	23.	20.	98.9
1.02	7.40	190	31.67	145.	25.	22.	98.9
1.02	7.50	191	31.83	171.	27.	24.	99.0
1.02	8.00	192	32.00	194.	30.	26.	99.0
1.02	8.10	193	32.17	216.	37.	28.	99.1
1.02	8.20	194	32.33	235.	45.	31.	99.1
1.02	8.30	195	32.50	253.	53.	33.	99.2
1.02	8.40	196	32.67	267.	61.	36.	99.2
1.02	8.50	197	32.83	278.	69.	39.	99.3
1.02	9.00	198	33.00	288.	78.	42.	99.3
1.02	9.10	199	33.17	296.	86.	45.	99.4
1.02	9.20	200	33.33	303.	95.	48.	99.4
1.02	9.30	201	33.50	309.	103.	51.	99.5
1.02	9.40	202	33.67	315.	111.	53.	99.5
1.02	9.50	203	33.83	319.	119.	56.	99.6
1.02	10.00	204	34.00	323.	127.	59.	99.7
1.02	10.10	205	34.17	326.	135.	62.	99.7
1.02	10.20	206	34.33	329.	143.	64.	99.8
1.02	10.30	207	34.50	331.	150.	67.	99.8
1.02	10.40	208	34.67	333.	157.	69.	99.9
1.02	10.50	209	34.83	335.	164.	72.	99.9
1.02	11.00	210	35.00	336.	171.	74.	99.9
1.02	11.10	211	35.17	337.	177.	76.	100.0
1.02	11.20	212	35.33	338.	186.	78.	100.0
1.02	11.30	213	35.50	339.	194.	80.	100.1
1.02	11.40	214	35.67	340.	202.	82.	100.1
1.02	11.50	215	35.83	340.	210.	84.	100.1
1.02	12.00	216	36.00	341.	217.	86.	100.2
1.02	12.10	217	36.17	349.	224.	88.	100.2
1.02	12.20	218	36.33	373.	231.	89.	100.2
1.02	12.30	219	36.50	420.	241.	92.	100.3
1.02	12.40	220	36.67	495.	253.	94.	100.3
1.02	12.50	221	36.83	609.	269.	98.	100.4
1.02	13.00	222	37.00	770.	292.	104.	100.5
1.02	13.10	223	37.17	970.	324.	112.	100.7
1.02	13.20	224	37.33	1201.	365.	122.	100.9
1.02	13.30	225	37.50	1451.	437.	135.	101.1
1.02	13.40	226	37.67	1711.	544.	150.	101.4
1.02	13.50	227	37.83	1977.	665.	167.	101.7
1.02	14.00	228	38.00	2240.	801.	184.	102.1
1.02	14.10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

1.02	14.20	230	38.33	2743.	1139.	326.	103.9
1.02	14.30	231	38.50	2985.	1438.	250.	103.3
1.02	14.40	232	38.67	3204.	1764.	270.	103.7
1.02	14.50	233	38.83	3413.	2095.	289.	104.0
1.02	15.00	234	39.00	3618.	2447.	307.	104.3
1.02	15.10	235	39.17	3817.	2764.	322.	104.6
1.02	15.20	236	39.33	4014.	3049.	336.	104.9
1.02	15.30	237	39.50	4232.	3338.	349.	105.1
1.02	15.40	238	39.67	4545.	3654.	361.	105.3
1.02	15.50	239	39.83	4980.	3987.	374.	105.6
1.02	16.00	240	40.00	5499.	4362.	388.	105.8
1.02	16.10	241	40.17	6129.	4795.	405.	106.1
1.02	16.20	242	40.33	6876.	5303.	426.	106.5
1.02	16.30	243	40.50	7668.	5886.	449.	106.9
1.02	16.40	244	40.67	8332.	6592.	473.	107.3
1.02	16.50	245	40.83	8794.	7275.	495.	107.7
1.02	17.00	246	41.00	9048.	7843.	514.	108.0
1.02	17.10	247	41.17	9109.	8268.	528.	108.3
1.02	17.20	248	41.33	9037.	8544.	537.	108.4
1.02	17.30	249	41.50	8802.	8673.	542.	108.5
1.02	17.40	250	41.67	8492.	8664.	541.	108.5
1.02	17.50	251	41.83	8108.	8539.	537.	108.4
1.02	18.00	252	42.00	7639.	8311.	530.	108.3
1.02	18.10	253	42.17	7112.	7989.	519.	108.1
1.02	18.20	254	42.33	6619.	7602.	506.	107.9
1.02	18.30	255	42.50	6186.	7187.	492.	107.7
1.02	18.40	256	42.67	5768.	6768.	479.	107.4
1.02	18.50	257	42.83	5348.	6348.	465.	107.2
1.02	19.00	258	43.00	4917.	5943.	451.	106.9
1.02	19.10	259	43.17	4457.	5572.	436.	106.7
1.02	19.20	260	43.33	3993.	5173.	420.	106.4
1.02	19.30	261	43.50	3530.	4753.	404.	106.1
1.02	19.40	262	43.67	3102.	4324.	387.	105.8
1.02	19.50	263	43.83	2694.	3897.	370.	105.5
1.02	20.00	264	44.00	2323.	3480.	354.	105.2
1.02	20.10	265	44.17	1985.	3103.	338.	104.9
1.02	20.20	266	44.33	1685.	2789.	323.	104.6
1.02	20.30	267	44.50	1423.	2482.	308.	104.4
1.02	20.40	268	44.67	1209.	2192.	294.	104.1
1.02	20.50	269	44.83	1030.	1947.	281.	103.9
1.02	21.00	270	45.00	880.	1736.	269.	103.6
1.02	21.10	271	45.17	751.	1549.	257.	103.4
1.02	21.20	272	45.33	642.	1392.	247.	103.2
1.02	21.30	273	45.50	548.	1245.	237.	103.0
1.02	21.40	274	45.67	468.	1131.	227.	102.9
1.02	21.50	275	45.83	399.	1040.	218.	102.7
1.02	22.00	276	46.00	342.	976.	210.	102.5
1.02	22.10	277	46.17	294.	913.	201.	102.4
1.02	22.20	278	46.33	253.	851.	193.	102.2
1.02	22.30	279	46.50	218.	792.	185.	102.1
1.02	22.40	280	46.67	188.	736.	177.	101.9
1.02	22.50	281	46.83	162.	684.	170.	101.8
1.02	23.00	282	47.00	139.	634.	163.	101.6
1.02	23.10	283	47.17	119.	587.	156.	101.5
1.02	23.20	284	47.33	102.	543.	150.	101.4
1.02	23.30	285	47.50	87.	501.	144.	101.3
1.02	23.40	286	47.67	74.	461.	138.	101.2
1.02	23.50	287	47.83	63.	424.	133.	101.1
1.03	0.00	288	48.00	55.	391.	128.	101.0
1.03	.10	289	48.17	49.	372.	124.	100.9
1.03	.20	290	48.33	44.	354.	119.	100.8

PEAK OUTFLOW IS 8673. AT TIME 41.50 HOURS

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME

CFS	8673.	5387.	1578.	[illegible]	229914.	
CMS	246.	153.	45.	22.	6510.	
INCHES		16.57	19.38	19.61	19.61	
MM		420.05	492.22	498.02	498.02	
AC-FT		2671.	3130.	3167.	3167.	
THOUS CU M		3295.	3861.	3906.	3906.	

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RUNOFF SUMMARY, AVERAGE FLOW IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES(SQUARE KILOMETERS)

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	1	9109.	5544.	1625.	923.	3.03
		(257.94)(	156.99)(	46.01)(	26.14)(	7.85)
ROUTED TO	2	8673.	5387.	1578.	893.	3.03
		(245.59)(	152.53)(	44.69)(	25.45)(	7.85)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	98.50	98.50	102.00
STORAGE	0.	0.	181.
OUTFLOW	0.	0.	267.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.00	108.52	6.52	542.	8673.	9.67	41.50	0.00

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FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
****

TRASOUT 17:13 FEB 20,'81

1**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
****

1 PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT 1
ROUTE HYDROGRAPH TO 2
END OF NETWORK

1**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
****

RUN DATE= 81/02/20.
TIME= 17.07.09.

TRANQUILITY LAKE DAM (00275)
INFLOW HYDROGRAPHY AND ROUTING
N J DAM INSPECTION

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
290	0	10	0	0	0	0	0	4	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 5 LRTIO= 1

RTIOS= .10 .20 .30 .40 .50

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SUB-AREA RUNOFF COMPUTATION

COMPUTE HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	3.03	0.00	3.03	.80	0.000	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.00	112.00	123.00	132.00	142.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.15	0.00	0.00

UNIT HYDROGRAPH DATA

PRECESSION DATA

STRTQ= -2.00 QRCSN= 0.00 RTIOR= 1.00

0 MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	END-OF-PERIOD FLOW COMP Q
					SUM	24.99 20.22 4.77 238590.
						(635.)(514.)(121.)(6756.12)

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HYDROGRAPH ROUTING

ROUTING COMPUTATIONS

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	0	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	0.	-1

STAGE	98.50	99.00	100.00	101.00	102.00	102.75	103.00	103.50	104.00	105.00
	107.00	109.00								
FLOW	0.00	29.00	179.00	392.00	767.00	1060.00	1212.00	1609.00	2078.00	3205.00
	6046.00	9509.00								
SURFACE AREA=	51.	51.	52.	53.	53.	54.	54.	55.	58.	
CAPACITY=	0.		77.	129.	181.	235.	289.	343.	570.	
ELEVATION=	99.	99	100.	101.	102.	103.	104.	105.	109.	

CREL	SPID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
102.0	0.0	0.0	0.

PEAK OUTFLOW IS 575. AT TIME 42.67 HOURS

PEAK OUTFLOW IS 1409. AT TIME 42.17 HOURS

PEAK OUTFLOW IS 2390. AT TIME 41.83 HOURS

PEAK OUTFLOW IS 3311. AT TIME 41.83 HOURS

PEAK OUTFLOW IS 4243. AT TIME 41.67 HOURS

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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .10	RATIO 2 .20	RATIO 3 .30	RATIO 4 .40	RATIO 5 .50
HYDROGRAPH AT	1	3.03	1	911.	1822.	2733.	3644.	4555.
		(7.85)		(25.79)(	51.59)(	77.38)(	103.18)(	128.97)(
ROUTED TO	2	3.03	1	575.	1409.	2390.	3311.	4243.
		(7.85)		(16.28)(	39.88)(	67.67)(	93.76)(	120.15)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	98.50	98.50	102.00
STORAGE	0.	0.	181.
OUTFLOW	0.	0.	767.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	101.49	0.00	154.	575.	0.00	42.67	0.00
.20	103.25	1.25	248.	1409.	3.83	42.17	0.00
.30	104.28	2.28	304.	2390.	5.33	41.83	0.00
.40	105.07	3.07	347.	3311.	6.17	41.83	0.00
.50	105.73	3.73	384.	4243.	6.83	41.67	0.00

1**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 24 FEB 79
****

APPENDIX 4

REFERENCES

APPENDIX 4

REFERENCES
TRANQUILITY LAKE DAM

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5. Brater, Ernest F. and Kings, Horace W., Handbook of Hydraulics, 5th Edition, McGraw-Hill Book Company 1963.

6. United States Army Corps of Engineers, Flood Hydrograph Package (HEC-1), Davis, Calif., September 1978.

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8. United States Dept. of Agriculture, SCS, A Method for Estimating Volume and Rate of Runoff in Small Watersheds, SCS-TP-149, Revised April 1973.

9. United States Dept. of Agriculture, Soil Conservation Service, Somerset, N. J. Urban Hydrology for Small Watersheds, Technical Release No. 55 Jan. 1975.

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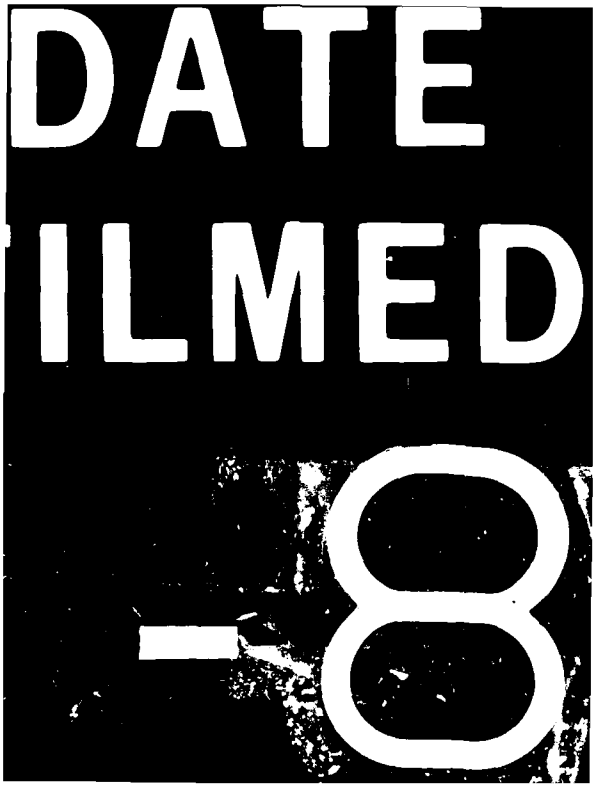
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